PULP & PAPER

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Issue focus: **World review of the pulp and paper industry**

Madison expands supercalendered, uncoated groundwood paper capacity 90

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Volume 56 Number 8 August 1982

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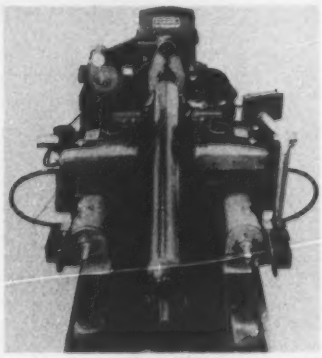
Madison Paper Industries 90



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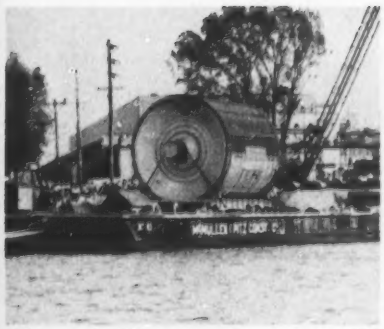

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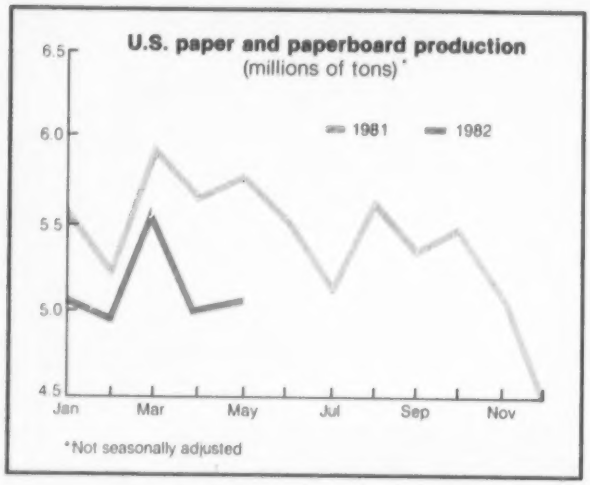
MONTH IN STATISTICS

U.S. paper and paperboard production in May totaled 5.1 million short tons, 7.9% below May 1981 levels, according to the American Paper Institute. Adjusted for seasonal and workday factors, the May production rate came to 59.9 million tpy, down from the first-quarter 1982 average of 60.9 million tpy.

Among major grades, only tissue production was up in May over year-earlier levels. For January through June on an annualized basis, newsprint continued to show the strongest pattern, up 3.5% over the same period a year ago, while tissue production held close to year-earlier levels and packaging and industrial grades were down 10.3%. All sectors of paperboard, paced by kraft linerboard, showed declines, with the largest drop in semichemical medium. Weekly data for the first two weeks of June indicate that paperboard production moved below its May rate, while paper production appeared to have remained flat.

Total Canadian newsprint shipments in May came to 718,000 metric tons, down 3.6% from May 1982, according to the Canadian Pulp & Paper Assn. Newsprint mill operating rates climbed to 88% in May from 84% in April, but were still well below the 97% of a year earlier.



		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	May	424	−4.3	5,274	3.5
Uncoated groundwood (s)	May	119	−2.5	1,400	−5.4
Coated paper (s)	May	410	–	4,917	−0.6
Uncoated free sheet (s)	May	630	−10.4	7,876	−3.6
Unbleached kraft packaging and industrial (s)	May	270	−21.1	3,686	−10.3
Tissue	May	390	1.0	4,497	−0.6
Total paper	**May**	**2,475**	**−6.7**	**30,660**	**−2.7**
Kraft linerboard, unbleached	May	1,195	−9.3	14,0[illegible]	−7.9
Semichemical medium	May	390	−8.0	4,510	−9.6
Bleached paperboard	May	329	−6.1	3,819	−6.5
Recycled paperboard	May	571	−9.9	6,847	−6.9
Total paperboard	**May**	**2,587**	**−8.9**	**30,299**	**−7.6**
Total paper and paperboard*	**May**	**5,062**	**−7.9**	**60,960**	**−5.2**
PULP, WASTEPAPER & FIBER[2]					
Total woodpulp production	April	4,208	−7.0	51,207	−3.5
Market pulp production	April	494	0.4	5,976	−3.2
Wastepaper consumption at paper/board mills	April	1,157	−5.8	13,834	−3.4
Pulpwood consumption (cords)	May	6,791	−1.3	80,142	−0.9
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	May	18.720	−6.1	97.519†	−6.5
Containerboard inventories at box plants	May 1	2,656	19.0		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	April	600	−14.2	7,836	−7.8
Imports of Canadian newsprint	April	500	−13.0	6,625†	−6.5
U.S. paper exports (including products)	April	343	−22.7	4,149	−16.3
Exports of unbleached kraft linerboard	May	181	−1.6	1,941	−5.3
Exports of woodpulp	April	316	9.0	3,477	−4.7
CANADIAN STATISTICS[4] (reported in metric tons)					
Total newsprint shipments	May	718	−3.6	3,535†	−3.8
Operating rates	May	88%	97%	91%	97%
Inventories held by U.S. consumers	May 31	1,593	21.4		
Woodpulp shipments (export only)	May	509	−16.0	2,468†	−17.3
Operating rates	May	81%	89%	83%	92%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. Canadian Pulp & Paper Assn. *Includes construction and wet machine grades. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

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This inflation is disinflation

When the dawn of 1982 emerged in the freezing winds of January, there were few New Year forecasts that anticipated the dramatic decline of inflation rates experienced this year. To move from an era of double-digit Consumer Price Index rises to one in which the index *actually* declined was an unthinkable likelihood.

But the CPI has in fact gone South. No one expects these depressed rates to continue, yet everyone is sure that the hyper-increases of recent years will not be repeated in the near term.

How, then, do we behave in a disinflationary economy if prices do not rise 10% to 15% per year? Real estate will not just automatically double in four to five years (or one to two years if in California). Taxes, which have to pay for the increasing costs of reduced levels of government service, may in fact stabilize or even decline. And the increased real earnings that workers bring home may begin to reflect the purchasing power that inflation robbed workers of during the past decade.

Disinflation and collective bargaining. These two things have already had a dramatic impact on labor agreements in just the first six months of this year.

The last paper mill labor agreement of 1981 had a wage increase of 25% to 26% over three years. By June 1982, settlements were being reached at 6% for each of three years, and companies that had negotiated agreements in 1981 were asking for, and getting, wage deferrals of already negotiated agreements.

These early 1982 settlements reflected the ratcheting downward in expectations of employees and employer. The mood of the country was changing. The Teamsters, rubber workers, and auto workers all negotiated so-called "concession agreements."

The national unemployment rate is currently at 9.5% and trending upward. Hourly compensation, although up by 9.3% in 1981, showed the first year-to-year relative decline in this rate in five years. This trend continued into the first quarter of 1982 when first-year wage increases, which had generally been averaging between 9% and 10%, were reported at the unprecedented rate of 2.2%! This unusually depressed statistic reflected the settlements made in the major smokestack industries of America—rubber, auto, steel, and trucking.

The so-called bellwether unions—the Teamsters, United Auto Workers, and Rubber Workers—all demonstrated an increased willingness to cooperate with management in reducing production costs by agreeing to wage and benefit freezes or reductions and giving back provisions of previously negotiated agreements. It is not unusual that these concessions were made when we recognize that 25% of these industries' workers were currently laid off (see table).

We have also seen the willingness of unions to reopen existing contracts with a view toward reducing the already negotiated wages and benefits in order to permit employers to continue operations. There's no question that jobs are more important than wage increases.

While a painful process, these adjustments taking place on the wage side of the economy are not unusual. They are part of the overall economic "sobering up" process that is taking place in the economy after the excesses of the 1970s. We see not only that the wage earner is affected by this economic squeeze called disinflation, but also that reduced earnings of companies, increasing bankruptcies, and attempts to downsize government and its impact on the private sector all suggest that this process is not one that will be gone in the next year.

In the paper industry, an industry that has seen double-digit settlements over a good part of the past decade, bargaining seems to be producing lower levels of wages and benefits with each turn of the calendar page. Holidays and vacations, which have almost been automatically included in agreements, are no longer being improved. Rather than paying for time not worked, employers are now paying what the marketplace permits them to.

The consequences. According to the Bureau of National Affairs, of the contracts signed in the first quarter of 1982, 42% had work-rule concessions, 39% had holiday concessions, 48% had wage and benefit freezes, and 51% had wage and benefit reductions. While undoubtedly painful, these events reflect an adjustment process in our economy that will hopefully contribute to an economic expansion in the decade ahead.

Industries bargaining 1982
(number of employees)

	1979	1982	% change
Petroleum	60,000	55,000	− 8%
Rubber	53,000	42,000	−21%
Trucking	425,000	300,000	−29%
Auto (GM)	652,000	449,000	−31%

Bleached paperboard:
Slight increase in 1981, but 1982 will be slow

Statistics:	1980	1981	1982e
Production, 000 tons	3862	3910	3700
Capacity, 000 tons	4180	4015	4049
Utilization rate, %[1]	92.4	97.4	90.1
Imports, 000 tons	—	—	—
Exports, 000 tons[2]	606	584	580
Apparent U.S. consumption			
000 tons	3256	3326	3120
lb/capita	29.25	29.56	27.55
000 tons/$billion real GNP (1972)	2.20	2.20	2.06

[1]Because of grade switching, capacity utilization is difficult to define.
[2]Census data.

Grade structure: Solid bleached sulfate (SBS) paperboard is used principally for folding cartons and milk carton stock. A small amount is used for linerboard. Bleached boards are made in a range of calipers, typically 10 pt to 28 pt, and in three levels of apparent density—low, medium, and high. About 50% of the tonnage is coated. Basis weights range from about 120 lb to 300 lb/3000 ft².

Production/capacity: Bleached paperboard production in 1981 rose 1.2% to 3.91 million tons following a decrease in production in 1980 to 3.86 million tons. This figure represents an industry operating rate of 97.4% based on a total capacity of 4.015 million tons. Exports in 1981 decreased 3.6% to 584,000 tons from 606,000 tons exported in 1980. The increase in production offset the lowering of exports and resulted in an increase in apparent U.S. consumption to 3.32 million tons.

Capacity decreased 3.9% in 1981, contributing to the higher operating rate. Industry capacity for SBS is difficult to define since some machines also made bristols, board, and market and fluff pulps, and when demand for market pulp is strong, mills switch their grade mix to take advantage of higher margins. Thus, actual industry capacity is higher than reported. From 1970 to 1980, production increased at a 1.01 rate, and capacity grew at a 1.7% average annual rate. Industry capacity will remain mostly flat through 1984 at about 4.04 million tons.

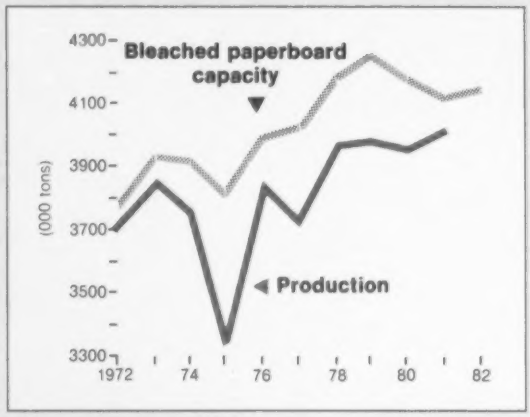
Outlook: The SBS paperboard market outlook depends on a number of factors—export markets, folding carton market share, and new market penetration—so is difficult to forecast.

The export market for SBS board, which has grown substantially in recent years, particularly in milk carton stock, is forecast to decrease slightly in 1982. But this remains a major potential growth area in 1983 and beyond. Many world markets are switching from glass bottles to milk cartons, which will maintain a high demand for SBS in offshore markets.

Domestic liquid packaging applications, which have been declining recently (particularly for milk cartons), are leveling off. Several sectors, such as juice cartons, are potential growth areas. And a new product in the milk carton market—gallon packages consisting of two half-gallon containers—could regain some lost market share. Another growth area is hot-fill beverage cartons which extend shelf life without refrigeration.

Ovenable paperboard is another area that looks promising, particularly if microwave oven sales continue to grow. This is currently a small market in terms of tonnage.

However, with nondurable spending expected to be weak in 1982, and increased competition from recycled folding grades benefitting from low wastepaper prices, SBS folding carton market share will be tough to hold. Demand for SBS from the fast-food sector has been a solid area and has recently grown. But depressed resin prices have resulted in intense competition from plastics in cupstock, plates, and trays.



Estimated capacities of major U.S. companies are:

	Annual capacity (000 tons)	Capacity share (%)
1. International Paper Co.	950	23.5
2. Potlatch Corp.	508	12.5
3. Westvaco Corp.	410	10.1
4. Continental Forest Industries	370	9.1
5. Federal Paper Board Co.	330	8.1
6. Temple-Eastex Inc.	310	7.7
7. Champion International	245	6.1
8. Weyerhaeuser Co.	200	4.9
9. James River[1]	200	4.9
10. Container Corp. of America	170	4.2
11. Georgia-Pacific Corp.	150	3.7
12. Gilman Paper Co.	150	3.7
13. Gulf States Paper Corp.	150	3.7
14. Mead Corp.	110	2.7
15. Union Camp Corp.	90	2.2
16. St. Regis Paper Co.	50	1.2

[1]Formerly American Can Co.

U.S. capacity (1982): **4.049 million tons**
Capacity share of top five companies: 63.4%
Capacity share of top ten companies: 91.2%

Pricing: Dollar value of SBS has more than doubled since 1972. Prices increased 6% to 7% in June and July of 1981 and this increase has held, although some discounting has occurred.

Approximate price history for 15-pt coated SBS board in $/short ton at year end: 1972, 192; 1973, 250; 1974, 350; 1975, 355; 1976, 385; 1977, 405; 1978, 445; 1979, 490; 1980, 518; 1981, 625; 1982e, 625.

Markets: Approximate end-uses for SBS board are: 43% folding carton; 22% milk carton; 11% cup and container; 11% export; 7% plate, dish, tray; 2% linerboard; and 4% other packaging and nonpackaging uses.

WORLDWIDE PULP/PAPER INDUSTRY: less output, lower profits in 1981

Decline set in at midyear after early good start; worldwide paper/board output rose slightly but pulp production, operating rates, and profits fell

By MARTIN BAYLISS and PETER SUTTON, International Editors

☐ The promise of the early months of 1981 turned to disappointment as the year progressed. As in 1980, high U.S. interest rates slowed progress in the North American economy. The effects spread worldwide, bringing recession to nearly every industrial country and slowing down growth in even the most dynamic of the developing nations.

Pulp and paper suffered along with the rest of the world economy. Markets and prices weakened progressively as the year went on, and the slide speeded up in the early part of 1982, leading to the worst crash in pulp prices since the unfortunate events of 1976-77.

In 1981, output of paper and board worldwide rose by 0.3% to about 171 million metric tons*; while pulp production fell by 0.6% to about 131 million tons. It seems likely that real consumption for paper and board gained more than these figures would indicate but that destocking in the face of high interest rates reduced demand.

End-users of pulp, paper, and board ran down their stocks during the year as far as they could in a process that has continued in 1982. In midyear, inventories may be as low as they can go and any upturn is expected to have an immediate and substantial effect on demand.

Market pulp stocks at producer mills have risen by a very large amount in the past year, however, and by the end of May 1982 stood at over 1.8 million metric tons in the Norscan group of countries; this is 700,000 tons more than 12 months earlier. Brazilian stocks were also believed to be much higher than a year ago. *(Continued)*

** In this review, data from all countries, including the U.S., conform with FAO definitions. Thus, paper/board totals do not include insulation board; pulp figures exclude screenings, defibrated, and exploded pulps.*

Production by continents, world total (000 metric tons)

	PULP					PAPER AND PAPERBOARD					
	1960	**1970**	**1979**	**1980**	**1981**		**1960**	**1970**	**1979**	**1980**	**1981**
North America	32,964	54,912	64,554	65,969	66,434	North America	38,917	58,914	71,029	70,225	71,295
Europe	20,965	34,853	39869	40,235	39,983	Europe	25,634	45,159	59,024	59,023	59,193
Asia/Australasia	5,156	14,268	16,719	18,239	17,094	Asia/Australasia	7,861	20,621	30,774	31,962	31,186
Latin America	821	2,224	4,766	5,848	5,789	Latin America	1,656	3,712	7,754	7,737	7,578
Africa	124	900	1,369	1,502	1,652	Africa	288	892	1,617	1,717	1,813
World total	**60,031**	**107,157**	**127,277**	**131,793**	**130,952**	**World total**	**74,355**	**129,298**	**170,198**	**170,664**	**171,065**

Global pulp, paper, and board capacity rose sharply in 1981. Paper and board capacity rose by at least seven million metric tons to a little over 200 million tons. Pulp capacity went up by a little less to 154 million tons total.

The combination of stagnant or declining production and the sizable increase in capacity led to a significant slowdown in operating rates. For pulp and for paper/board, they fell to around 85% worldwide, a clear decline from 1980 levels.

Paper and board production. In North America, output rose by a million metric tons, and by a small amount in Africa and parts of Western and Eastern Europe. But in the European Economic Community (EEC), Asia, and Latin America there were declines from 1980 levels.

Western Europe as a whole was one of the regions where output fell last year. This was entirely the result of a 300,000-ton decline in the EEC, which outbalanced small rises in Scandinavia and the rest of the region.

The main drop came in the U.K., which had suffered the closure of dozens of machines in 1980 and entered 1981 with capacity down by almost 20% from the previous year's level. But there were notable drops, too, in Italy and the Netherlands, both of which have had deep-reaching problems of their own.

Sweden also lost some ground, but the rest of Western Europe showed modest gains all around. In Eastern Europe, 1981 was not too bad and most countries registered good gains. The one exception was Poland, where the political upheavals led to a drop of 12%-13% in output.

Japanese production dropped by 1.1 million tons in 1981 and there was a small downturn in the Philippines. In every other major country there were gains in 1981, though growth was not so rapid as usual. But the increases elsewhere were not nearly enough to compensate for the losses in Japan.

Total output was also down in Latin America, where Brazilian and Argentine production was off sharply, while Chile and Uruguay also lost some ground. There were moderate increases elsewhere, with Mexico leading the way; but, as in Asia, the rate of growth was lower than normal.

Very little accurate information is available on African production, largely because there is so little of it. South Africa, which makes about two-thirds of the continent's paper and board, enjoyed a good year with a strong upturn, but elsewhere little progress was made.

Worldwide, the one paper grade to register a significant increase in output in 1981 was newsprint. A number of large new machines started up in 1980-81, notably in North America, and production rose by almost a million metric tons to 26.6 million tons. In North America alone, output was up by 800,000 metric tons.

In the case of printing/writing papers, the 1981 drop in production came despite installation of several large new machines in the last couple of years. This suggests that many smaller machines were closed down—which indeed appears to be the case, though it is not clear how many were for printing/writing grades.

In Western Europe alone, over 80 paper and board mills shut last year; at least 50 in EEC countries, 11 in Scandinavia, and roughly 20 in the rest of Western Europe. A further 70 shut down in North America. Elsewhere, figures indicate that another 50 or so are thought to have closed.

Pulp decline. Total world pulp production fell by over 800,000 metric tons in 1981, largely as a result of the serious deterioration in the Japanese industry and the somewhat less dramatic reduction in EEC output.

In Japan, production fell by nearly 1.3 million tons or almost 14% from 1980 levels, while in the EEC output dropped by a little over 400,000 tons or about 7%. North American output was up by half a million tons (less than 1%), and African by 150,000 tons (10%), while elsewhere there was relatively little change.

Output of mechanical pulp rose by half a million metric tons in 1981 compared to 1980. This was no doubt largely due to the increase in newsprint production. Output of chemical and other grades of pulp fell from the previous year's total, however.

Pulp production expressed as a percentage of paper and board production also declined in 1981, continuing a long-term trend. The percentage of pulp to paper and

World's top 20 producing and consuming countries

PAPER AND BOARD PRODUCTION (000 metric tons)

	1981	1980
1. United States	57,765	56,836
2. Japan	16,980	18,088
3. Canada	13,530	13,389
4. U.S.S.R	8,955	8,732
5. Fed. Rep. Germany	7,795	7,580
6. Finland	6,135	5,919
7. Sweden	6,131	6,189
8. China	5,400	5,350
9. France	5,148	5,151
10. Italy	4,844	4,935
11. United Kingdom	3,381	3,793
12. Brazil	3,297	3,468
13. Spain	2,588	2,566
14. Mexico	1,950	1,895
15. Korea, Republic of	1,783	1,693
16. Netherlands	1,683	1,714
17. Austria	1,671	1,616
18. Taiwan	1,498	1,479
19. Australia	1,394	1,471
20. Norway	1,373	1,373

PULP PRODUCTION (000 metric tons)

	1981	1980
1. United States	47,159	46,025
2. Canada	19,275	19,944
3. U.S.S.R.	9,060	8,950
4. Japan	8,612	9,788
5. Sweden	8,529	8,699
6. Finland	7,331	7,234
7. China	5,080	5,190
8. Brazil	3,500	3,507
9. Fed. Rep. Germany	2,021	1,995
10. France	1,715	1,829
11. Norway	1,608	1,494
12. Spain	1,364	1,329
13. Austria	1,210	1,229
14. New Zealand	1,160	1,147
15. South Africa	1,122	1,012
16. Italy	962	1,075
17. Portugal	895	865
18. Czechoslovakia	880	855
19. Romania	815	815
20. Chile	743	763

PER CAPITA CONSUMPTION (lb/yr)

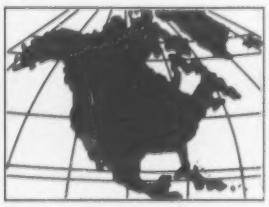
	1981	1980
1. United States	590	600
2. Sweden	441	452
3. Finland	437	357
4. Canada	434	474
5. Switzerland	366	370
6. Denmark	359	359
7. Fed. Rep. Germany	346	342
8. Netherlands	340	342
9. Japan	315	337
10. Norway	311	309
11. Belgium	311	304
12. Australia	302	320
13. New Zealand	298	282
14. United Kingdom	273	269
15. France	254	256
16. Austria	238	236
17. Ireland	205	205
18. Iceland	201	183
19. Italy	192	192
20. Israel	181	174

board produced in 1980 was 77.3%, but in 1981 it dropped to 76.6%.

The one significant upward movement in 1981 came in wastepaper consumption, which increased by 2.7% to over 49 million metric tons. Worldwide, wastepaper now represents nearly 29% of paper and board production. Some five million tons of wastepaper were traded.

The recession exerted strong downward pressure on the industry's capital investment programs. Announcements of major new projects were scarce throughout the world, and several programs which had seemed well underway back in 1980 suddenly appeared less likely to be realized.

The *PPI Projects Survey 1982-85*, published in mid-1982, reported a slower capacity growth for this three-year period than in earlier annual surveys. Estimates for the 1982-85 term are for 12.6 million annual metric tons worldwide of new paper and board capacity to be added by confirmed projects (orders actually placed) and 11.1 million annual tons of new pulp capacity. Projects in the advanced planning stage should add another 4.1 million tons of paper/board and 2.5 million tons of pulp, according to the *PPI* survey.



NORTH AMERICA

LEADING NORTH AMERICAN companies saw 1981 profits drop for the second year running, though weakness in the wood products sector had a worse effect than any decline in pulp and paper sales. Demand for wood products fell because of the poor state of the construction industry in North America.

Paper and board production in U.S. and Canada totaled 71.3 million metric tons in 1981, a rise of 1.5% from 1980. In the U.S. there were small output increases for almost all paper grades, but board production fell by 100,000 tons from the 1980 level. Canadian end-of-year figures showed declines of a similar size in printing/writing and linerboard production.

Unsurprisingly, the North Americans remain the top producers in the world. In 1981 their share of world output was 42% of total paper and board and 51% of pulp. Pulp production in 1981 was 0.7% higher than in 1980, at 66.4 million metric tons. However, the performance of Canadian and U.S. pulp mills differed. While Canadian production fell (due primarily to labor disputes) to 19.3 million tons, a drop of 3.4%, U.S. mills increased output by 2.5% to 47.2 million tons.

North American production of newsprint, which is the Canadian industry's most important export, increased by 6.5% in 1981 to reach a new record of 13.7 million metric tons—over 50% of the world's total output. Canada's exports to the U.S. were down nearly 1% at 6.06 million tons, while its overseas exports increased by 18.6% to 1.81 million tons. This could mark the beginning of a shift in Canadian newsprint exports, with greater concentration on overseas markets rather than with the U.S., now the major trading partner.

Linerboard exports from North America in 1981 dropped 23% to 2.6 million metric tons. This was due largely to weakening in exports from U.S., which exports more than eight times as much liner as Canada. The American Paper Institute attributes the fall to such factors as Western Europe's recession (U.S. exports to that area were down more than 30%), the strength of the U.S. dollar, and the cut in imports by People's Republic of China (from the substantial quantity in 1980).

Market pulp sales. Weakening demand on the international pulp market throughout the second half of 1981 brought North American pulp exports down 6.7% to 9.9 million metric tons. The weakness has continued in 1982.

Canadian exports to the U.S. in 1981 were down 5.6% to 3.24 million metric tons. North American overseas exports fell by 7% to 6.6 million tons. These figures tie in with the rise in market pulp inventories and downtime at some Canadian mills taken to reduce stock levels. Canada's market pulp production in 1981 was 6.6 million tons, a drop of 8.6%. This results in an annual operating rate of 88%—more than 10% below the 1980 rate.

EUROPE

WESTERN EUROPE IN 1981 endured a difficult year, as economic growth slowed down almost to a stop, while unemployment continued to rise. In Eastern Europe, economic growth continued at reasonable levels but here, too, the worldwide recession did nothing to improve performance.

In most of Western Europe, governments maintained tight controls over spending in an attempt to keep inflation under control. The main exception was France, where the election of Francois Mitterrand's Socialist government led to reflationary policies designed to create demand and jobs.

The paper industry's progress faithfully reflected the rest of the economy. Total Western European paper and board production fell by 19,000 metric tons, to 47.7 million tons, while pulp output declined by a little over 300,000 tons to 27.7 million tons.

The key event of the year as far as the paper industry was concerned was undoubtedly the rise of the U.S. dollar on international money markets. Its value increased dramatically against every European currency, swinging the pendulum back in favor of the integrated paper and board producer.

In 1982 the dollar has strengthened still further, squeezing U.S. suppliers of pulp and kraftliner out of their traditional strongholds. Indeed, prices expressed in dollars fell so low by mid-1982 that North Americans were said to be selling marginal quantities of some products at below cost.

Estimates of production costs for chemical pulp in North America and Scandinavia show that the very considerable advantage the Americans used to enjoy has now disappeared. Wood costs are still lower in North America but cheaper energy and labor in Sweden outweigh more expensive raw materials.

The strength of the dollar has hurt nonintegrated paper producers in the European Economic Community as

1980-81 WORLD PULP, PAPER, AND

	Population (1,000)	Number of mills P & B	Number of mills Pulp	Capacity (1,000 m tons) P & B	Capacity (1,000 m tons) Pulp	Per capita (lb)	P & B consumption 1980	P & B consumption 1981	Pulp consumption 1980	Pulp consumption 1981	Production (1,000 m tons) P & B 1980	Production (1,000 m tons) P & B 1981	Production (1,000 m tons) Pulp 1980	Production (1,000 m tons) Pulp 1981
EUROPE														
Belgium	9,900	17	3	905	400	311	1,370	1,391	606	591	864	887	359	337
Denmark	5,150	6	3	318	133	359	832	842	152	166	253	268	120	117
France	54,000	172	28	5,500	2,000	254	6,220	6,231	3,309	3,212	5,151	5,148	1,829	1,715
Germany, Fed. Rep.	61,666	200	37	10,028	2,322	346	9,842	9,585	4,331	4,334	7,580	7,795	1,995	2,021
Greece	9,450	18	4	355	65	96	428	410	154	148	320	300	54	48
Ireland	3,200	2	0	70e	0	205	299	299	30	30	55	55e	19	19e
Italy	57,180	480	55	5,850	1,350	182	5,244	4,986	2,691	2,419	4,935	4,844	1,075	962
Netherlands	14,246	35	5	1,880	212	340	2,201	2,193	814	716	1,714	1,683	206	162
UK	55,950	117	3	3,900	180	273	6,837	6,781	1,869	1,696	3,793	3,381	288	140
EEC	**270,742**	**1,047**	**139**	**28,806**	**6,682**	**260**	**33,073**	**32,718**	**13,956**	**13,312**	**24,885**	**24,361**	**5,943**	**5,521**
Finland	4,800	46	52	7,025	8,510	437	1,167	1,342	5,331	5,682	5,919	6,135	7,234	7,331
Norway	4,093	23	27	1,650	1,945	311	497	522	1,329	1,483	1,373	1,373	1,494	1,606
Sweden	8,330	58	64	6,860	9,625	441	1,842	1,688	5,763	5,706	6,189	6,131	8,699	8,529
Scandinavia	**17,223**	**127**	**143**	**15,535**	**20,080**	**404**	**3,506**	**3,552**	**12,423**	**12,830**	**13,481**	**13,639**	**17,427**	**17,466**
Austria	7,508	36	22	1,911	1,356	239	838	827	1,155	1,149	1,616	1,671	1,229	1,210
Iceland	232	0	0	0	0	201	20	21	0	0	0	0	0	0
Malta	350	0	0	0	0	68	11	11	0	0	0	0	0	0
Portugal	9,905	108	8	650	1,000	112	452	501	461	464	535	569	865	895
Spain	37,500	212	35	3,108	1,652	154	2,669	2,631	1,416	1,423	2,566	2,588	1,329	1,364
Switzerland	6,370	29	5	1,030	320	366	1,064	1,060	551	549	914	920	285	296
Other W. Europe	**61,865**	**385**	**70**	**6,699**	**4,328**	**178**	**5,054**	**5,051**	**3,583**	**3,585**	**5,631**	**5,748**	**3,708**	**3,765**
Total W. Europe	**349,830**	**1,559**	**351**	**51,040**	**31,070**	**280**	**41,633**	**41,321**	**29,964**	**29,618**	**43,777**	**43,748**	**27,078**	**26,754**
Albania	2,750	4	4	10e	10e	11	14	14	8	8	8	8	8	8
Bulgaria	8,903	20	na	450	280	123	495	523	327	337	395	420	234	240
Czechoslovakia	15,450	49	24	1,282	1,031	166	1,176	1,160	932	977	1,206	1,225	853	880
German Dem. Rep.	16,740	21	19	1,250	700	179	1,378	1,350	826	791	1,237	1,248	666	679
Hungary	10,700	10	6	na	na	141	632	383	294	288	440	457	111	112
Poland	36,100	53	26	1,436	934	75	1,426	1,217	999	864	1,277	1,118	821	711
Romania	22,000	20	11	870	850	71	684	684	849	849	805	805	815	815
USSR	268,800	84	56	10,000	9,450	73	8,731	8,905	8,127	8,115	8,732	8,955	8,950	9,060
Yugoslavia	22,354	30	21	1,275	750	115	1,106	1,169	821	838	1,144	1,199	679	724
E. Europe	**403,797**	**291**	**167**	**16,573**	**14,005**	**84**	**15,642**	**15,405**	**13,163**	**13,067**	**15,246**	**15,435**	**13,157**	**13,229**
Total Europe	**753,627**	**1,850**	**518**	**67,613**	**45,075**	**186**	**57,275**	**56,726**	**43,147**	**42,685**	**59,023**	**59,203**	**40,235**	**39,983**
NORTH AMERICA														
Canada	24,200	112	36	15,600	23,100	434	4,549	4,763	12,895	12,821	13,389	13,530	19,944	19,275
USA	229,700	612	248	66,007	52,960	581	60,550	61,590	46,248	47,529	56,836	57,765	46,025	47,159
North America	**253,900**	**724**	**284**	**81,607**	**76,060**	**576**	**65,099**	**66,353**	**59,143**	**60,350**	**70,22"**	**71,295**	**65,969**	**66,434**
ASIA														
Afghanistan	15,800	0	0	0	0	0	5F	5e	0	0	0	0	0	0
Bangladesh	91,000	7	8	163	152	2	66	75	79	66	76	70	72	60
Bhutan	1,300	0	0	0	0	—	na	na	0	0	0	0	0	0
Burma	33,590	4	2	na	na	2	35	35e	17	17e	10	10e	17	17
Cambodia	8,870F	0	0	0	0	2	6F	6e	0	0	0	0	0	0
China, People's Rep.	988,000	1,600	na	6,300	5,600	13	5,882	5,208e	5,606	5,060e	5,350	5,400	5,190	5,060
Cyprus	630	0	0	0	0	174	50	50e	0	0	0	0	0	0
Hong Kong	5,200	2	0	30	0	265	600	623	1	0	12	23	0	0
India	660,000	159	264	1,816	1,500	4	1,488	1,523	0	0	1,088	1,148	na	na
Indonesia	147,000	31	14	370	1	9	513	548	81	171	232	250	81	81
Iran	40,000	17	3	330	260	31	606	540	75	150	111	129	75	100
Iraq	13,080	2	2	144	90	20	115	na	41	41	57	0	26	21e
Israel	3,976	5	0	155	na	181	315	326	60	55	126	137	0	0
Japan	117,890	593	66	22,473	12,788	315	17,926	16,795	11,904	10,206	18,088	16,980	9,788	8,612
Jordan	2,500	1	0	8	0	44	28	35	0	0	0	6	0	0
Korea, People's Rep.	19,000	6	2	100e	20	11	86	86	45	45e	80e	80e	45e	45e
Korea, Rep. of	38,723	170	5	2,180	314	93	1,561	1,840	654	742	1,693	1,783	186	222
Kuwait	1,370	0	0	0	0	94	52F	52e	0	0	0	0	0	0
Laos	3,770	0	0	0	0	—	1F	1e	0	0	0	0	0	0
Lebanon	3,160	3	0	20e	0	53	76F	76e	0	0	12	12e	0	0
Malaysia	13,923	12	na	100	na	71	445	445	4	4e	75	75e	na	na
Mongolia	1,670	0	0	0	0	11	8F	8e	0	0	0	0	0	0
Nepal	14,608	1	1	2F	2e	2	10	10e	2	2e	2F	2e	2	2e
Pakistan	82,500	17	17	120	95	4	171	212	63	102	89	102	55	90
Philippines	49,150	18	10	483	256	20	457	441	223	179	334	325	171	154
Saudi Arabia	9,292	0	0	0	0	24	102F	102e	0	0	0	0	0	0
Singapore	2,443	3	0	na	na	148	140	164	4,469	3,109	na	na	0	0
Sri Lanka	14,800	1	2	38	25	9	50	63	16	19	21	24	12	12
Syria	8,980	3	0	64	0	20	82	82e	0	0	3	3e	0	0
Taiwan	18,100	160	3	1,900	450	172	1,412	1,403	304	335	1,479	1,498	276	350
Thailand	47,875	34	7	458	150	24	471	527	145	169	355	394	63	69
Turkey	46,000	13	12	716	548	29	523	570	337	323	470	514	267	319
United Arab Emirates	900	0	0	0	0	—	na	na	0	0	0	0	0	0
Vietnam	52,300	55e	50e	147	107	2	45	53	33	36	45e	53e	33e	36e
Yemen Arab. Rep.	5,393	0	0	0	0	—	na	na	0	0	0	0	0	0
Yemen Dem. Rep.	1,863	0	0	0	0	2	2F	2e	0	0	0	0	0	0
Asia	**2,564,656**	**2,917**	**470**	**38,117**	**22,358**	**22**	**33,394**	**31,737**	**24,159**	**22,991**	**29,808**	**29,024**	**18,379**	**15,270**

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na = not available. e. = estimate. F = FAO estimate.

BOARD INDUSTRY AT A GLANCE

	Population (1,000)	Number of mills P & B	Number of mills Pulp	Capacity (1,000 m tons) P & B	Capacity (1,000 m tons) Pulp	Per capita (lb)	P & B consumption 1980	P & B consumption 1981	Pulp consumption 1980	Pulp consumption 1981	Production (1,000 m tons) P & B 1980	Production (1,000 m tons) P & B 1981	Production (1,000 m tons) Pulp 1980	Production (1,000 m tons) Pulp 1981
AUSTRALASIA														
Australia	14,900	17	16	1,730	875e	[illegible]	2,098	2,045	967	911	1,471	1,494	713	656
Fiji	634	0	0	0	0	23	9	9e	0	0	0	0	0	0
New Zealand	3,195	5	6	798	1,385	338	399	416	663	662	683	711	1,147	1,160
Papua New Guinea	3,600	0	0	0	0	4	6	6e	0	0	0	0	0	0
Samoa	160	0	0	0	0	na	na	na	0	0	0	0	0	0
Australasia	**22,489**	**22**	**22**	**2,528**	**2,260**	**[illegible]**	**513**	**2,476**	**1,670**	**1,583**	**2,154**	**2,105**	**1,860**	**1,819**
LATIN AMERICA														
Argentina	28,138	89	16	1,013	529	36	933	848	464	427	705	656	338	299
Bahamas	240	0	0	0	0	9	1F	1e	0	0	0	0	0	0
Barbados	279	0	0	0	0	40	5	5e	0	0	0	0	0	0
Belize	160	0	0	0	0	32	1e	1e	0	0	0	0	0	0
Bolivia	5,600	2	0	na	0	7	1e	1e	0	0	1F	1e	0	0
Brazil	122,000	160	48	4,000	3,900	34	3,466	3,233	2,766	2,782	3,466	3,297	3,507	3,500
Chile	11,390	18	7	379	513	56	299	325	327	369	327	320	763	743
Colombia	28,000	26	7	509	246	37	441	452	238	254	367	389	206	204
Costa Rica	2,307	2	1	15	5	110	26	22	10	7	13	12	5	5
Cuba	10,000	9	3	150	60	48	214	214	83	83	97e	97e	45e	45e
Dominican Republic	5,551	2	0	45e	0	13	36	36e	4	4e	9F	9e	0	0
Ecuador	8,350	9	5	60	30	24	94	94	44	44	54	54e	24	24e
El Salvador	4,810	3	0	40	na	33	64	43	0	0	20	20	0	0
Guatemala	75,000	3	0	48	na	40	89	93	25	30	45	48	0	0
Guyana	832	0	0	0	0	18	7F	7e	0	0	0	0	0	0
Haiti	5,740	0	0	0	0	2	6F	6e	0	0	0	0	0	0
Honduras	3,670	0	0	0	0	33	54F	54e	0	0	0	0	0	0
Jamaica	2,215	1	0	6e	0	55	39	39e	0	0	1F	1e	0	0
Mexico	70,000	80	27	2,556	993	79	2,430	2,519	939	995	1,895	1,950	731	783
Neth. Antilles	247	0	0	0	0	28	3F	3e	0	0	0	0	0	0
Nicaragua	2,500	0	0	0	0	26	36	30e	0	0	0	0	0	0
Panama	2,000	3	0	20	na	88	83	78	0	0	18	18	0	0
Paraguay	3,117	2	0	na	0	11	17F	17e	0	0	1F	1e	0	0
Peru	17,780	13	4	na	na	22	172	176	171	171	159e	163e	140e	140e
Surinam	355	0	0	0	0	84	13F	14e	0	0	0	0	0	0
Trinidad & Tobago	1,150	0	0	0	0	98	34F	34e	0	0	0	0	0	0
Uruguay	2,900	12	5	70	28	55	76	71	35	30	64	51	26	23
Venezuela	16,459	14	3	706	160	90	747	764	380	380	501	518e	63	63e
Latin America	**297,203**	**425**	**126**	**9,617**	**6,764**	**[illegible]**	**9,427**	**9,234**	**5,880**	**6,418**	**7,747**	**7,588**	**5,846**	**5,789**
AFRICA														
Algeria	19,700	5	3	133e	99e	16	182	182	57	57	77F	77e	24F	24e
Angola	7,080	3	1	40e	44e	9	28	28	35	35	14F	14e	35F	35e
Benin	3,570	0	0	0	0	2	3	3e	0	0	0	0	0	0
Botswana	820	0	0	0	0	—	na	na	0	0	0	0	0	0
Burundi	4,510	0	0	0	0	—	na	na	0	0	0	0	0	0
Cameroon	8,400	0	1	0	120	7	27	27	0	0	5F	5e	120	120e
Central African Rep.	2,284	0	0	0	0	—	na	na	0	0	0	0	0	0
Chad	4,508	0	0	0	0	—	na	na	0	0	0	0	0	0
Congo	1,540	0	0	0	0	2	1F	1e	0	0	0	0	0	0
Egypt	41,300	12	3	186	78	16	315	321	0	39	137	137	na	39
Ethiopia	32,600	2	na	10e	na	—	12	5	4	4	7F	4e	4F	4e
Gabon	585	0	0	0	0	4	1F	1e	0	0	0	0	0	0
Gambia	600	0	0	0	0	—	na	na	0	0	0	0	0	0
Ghana	11,742	0	0	0	0	2	8F	8e	0	0	0	0	0	0
Guinea	5,300	0	0	0	0	—	na	na	0	0	0	0	0	0
Ivory Coast	7,970	0	0	0	0	9	33F	33e	0	0	0	0	0	0
Kenya	16,400	1	1	55e	45e	9	65	65	15	15	48F	48e	15F	15e
Lesotho	1,340	0	0	0	0	—	na	na	0	0	0	0	0	0
Liberia	1,860	0	0	0	0	4	4e	4e	0	0	0	0	0	0
Libya	2,980	2	0	10e	na	11	14	14	0	0	5F	5e	0	0
Madagascar	9,000	1	1	30	5	2	12	11	0	4	9	8	na	4
Malawi	6,173	0	0	0	0	4	16	11e	0	0	0	0	0	0
Mali	6,910	0	0	0	0	—	1F	1e	0	0	0	0	0	0
Mauritania	1,630	0	0	0	0	—	na	na	0	0	0	0	0	0
Mauritius	960	0	0	0	0	11	5F	5e	0	0	0	0	0	0
Morocco	20,400	8	1	120	100	16	175	161	43	50	101	99	83	81
Mozambique	10,470	2	0	10e	na	4	19	19	0	0	2F	2e	0	0
Niger	5,346	0	0	0	0	—	na	na	0	0	0	0	0	0
Nigeria	85,000	3	3	14e	na	4	141	141	10	10	14e	14e	na	na
Rwanda	5,050	0	0	0	0	—	na	na	0	0	0	0	0	0
Senegal	5,660	0	0	0	0	4	17F	17e	0	0	0	0	0	0
Sierra Leone	3,470	0	0	0	0	—	na	na	0	0	0	0	0	0
Somalia	3,650	0	0	0	0	4	7F	7e	0	0	0	0	0	0
South Africa	29,360	16	10	1,321	1,193	59	1,314	1,368	840	944	1,200	1,288	1,012	1,122
Sudan	18,300	3	0	na	0	2	12	12	3	3	2F	2e	0	0
Swaziland	520	1	1	0	175	4	1	1	6	2	na	na	162	169
Tanzania	17,400	1	0	4e	na	2	23	23	0	0	3e	3e	0	0
Togo	2,563	0	0	0	0	—	1	1e	0	0	0	0	0	0
Tunisia	6,300	4	1	35	24	22	58	64	19	27	32	34	20	22
Uganda	13,225	1	0	2e	na	—	5	6	0	0	1F	1e	0	0
Upper Volta	6,910	0	0	0	0	—	1	1e	0	0	0	0	0	0
Zaire	28,090	1	0	2e	na	—	8	8	0	0	2F	2e	0	0
Zambia	6,052	1	1	16	14	7	17	16	0	0	0	16	na	na
Zimbabwe	7,480	2	2	na	na	16	58	56	32	32	58	56e	27	27e
Africa	**483,881**	**69**	**29**	**1,986**	**1,897**	**[illegible]**	**2,988**	**2,897**	**1,069**	**1,235**	**1,717**	**1,813**	**1,502**	**1,652**
WORLD TOTAL	**4,376,256**	**5,985**	**1,427**	**201,470**	**154,434**	**[illegible]**	**170,257**	**169,196**	**154,763**	**152,249**	**170,874**	**171,108**	**131,783**	**130,947**

well as North American suppliers. Despite the drop in apparent pulp prices to a mid-1982 level of $500 less discounts for bleached softwood kraft, the price in local currency may have risen by up to 30% since 1980.

And most producers throughout Western Europe are unhappy with their profits. Even in Sweden, whose currency has dropped by 38% against the dollar since 1980, most producers do not seem to expect significant profits in 1982.

The decline in European paper and board production in 1981 was mainly concentrated in the EEC. Output fell by over 300,000 metric tons, to 24.3 million tons—the second successive annual decline. Imports from non-EEC countries rose by 4% to 9.6 million tons, while exports went up by 4.7% to 1.1 million tons. Apparent consumption thus fell very slightly to 32.5 million tons.

The drop in output was not equally spread over all the ten member EEC states. In Fed. Rep. Germany, production rose by some 200,000 metric tons to just under eight million tons, a new record. In Belgium and Denmark, too, there were moderate increases.

The remaining producers all reported lower production than in 1980, though for some of them the change was statistically negligible. Two countries accounted for most of the drop: in the U.K., output fell by 400,000 metric tons, to 3.4 million tons; and in Italy, by 100,000 tons, to 4.8 million tons.

Mills continued to close, including some quite large ones, though at a somewhat slower pace than in 1980. Still, over 50 paper and board mills shut down in 1981, leaving 1045 mills at the end of the year. The closures included about 20 mills in Italy and 18 in U.K., with fewer mills in France, Belgium, Holland and Germany.

Despite the closures, total annual capacity remained about the same, at 28.7 million metric tons. Thus the average mill size increased from 26,000 to 27,500 tpy. Excluding Italy (which has nearly half the EEC's mills, many of them very small), the average mill size is now just over 40,000 tpy.

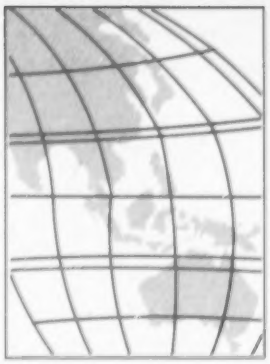
Pulp production and capacity in EEC also continued to drop during 1981. Production fell by over 7% to 5.5 million metric tons, with capacity reduced by a little over 300,000 tons to 6.7 million tons. Operating rates therefore were only 82%, slightly below the world average despite the very small amount of market output involved.

Over 20 pulp mills also shut down during the year, 15 of them in Italy. The average size of EEC pulp mills thus increased from 44,000 to 48,000 metric tpy.

In Scandinavia, 1981 was a better year—though far from satisfactory. Finnish pulp, paper, and board production rose by a reasonable margin, but there were substantial declines in Sweden. In Norway, paper/board output remained at the 1980 level while pulp production rose sharply (largely thanks to increased tonnage coming from the new Tofte mill).

In the rest of Western Europe, paper and board production rose by about 100,000 metric tons to 5.7 million tons, while pulp output went up by a small margin to 3.8 million tons. Still, weak demand affected the industry in those countries and few, if any, companies made satisfactory profits.

In Eastern Europe as a whole, paper and board production rose by nearly 200,000 metric tons in 1981, to 15.4 million tons, while pulp output went up almost 100,000 tons, to 13.2 million tons. If Poland's results are excluded, the upturn was a good deal more impressive.



ASIA/ AUSTRAL-ASIA

TOTAL ASIAN PAPER and board output in 1981 was just under 29 million metric tons, 2.5% down from 1980 and the first fall in production for many years. Australasia fared little better, with output dropping 2.3% to 2.11 million tons.

The reason for the decline in Asia was performance of the Japanese industry. Weak domestic demand and signs of a drop in exports forced Japanese manufacturers to cut back production and link it very closely to shipments. As a result, output was down by around one million metric tons, or 6.1%, for a total of 17 million tons.

Japan was the only one of the big five Asian producing nations to see a drop in production. Chinese output increased marginally (0.9%) to 5.4 million metric tons; Republic of Korea increased its paper/board output by 5.3% to 1.78 million tons; Taiwan's production went up by 1.3% to nearly 1.5 million tons; India's output was 1.15 million tons, up 5.5%. These five countries account for over 90% of total Asian production (excluding U.S.S.R.).

This is the first time since 1975 that annual production has been below the previous year. It also clearly shows the dominating position of Japan, which despite capacity cutbacks still made 57% of Asia's total paper/board in 1981.

Strict measures to cut overcapacity and hold production to demand are expected to be followed for most of 1982 by the Japanese industry, whose actions also affect others in the region—particularly those relying on pulp and woodchip exports to Japan.

Three of the other big producers—India, Taiwan and Korea—managed to raise production over the 1980 level, even though affected by similar problems, such as rising raw material and energy costs, and weak paper prices.

In People's Republic of China, paper/board capacity is expected to expand steadily and slowly, but demand exceeds production by so much that imports of paper and board will continue. The country's fiber shortage is also likely to require continuing pulp imports. Imports from U.S. in 1981 were 157,000 metric tons, up by 12.8%. China also purchased 40% of Chile's exports of unbleached kraft pulp in 1981, rising to second place in Chile's list of top buyers of forest products.

Pulp production in Asia in 1981 was also down from 1980, dropping by 6.8% to 15.2 million metric tons. Imports fell by 26.8% to 6.16 million tons. Once again, the Japanese market effectively determined the overall drop.

Australasia, which effectively means Australia and New Zealand, experienced a drop in pulp production of 2.2% to 1.82 million metric tons. The two countries also pushed pulp exports up slightly and imports fell by a similar amount.

For Australia and New Zealand, 1981 followed a pattern familiar to other areas. A good start faded away as 1981 progressed and the worldwide recession began to

make itself felt on exports, particularly on chip exports to the Japanese and Southeast Asian markets.

However, New Zealand's pulp, paper, and board output reached record levels last year, mainly because of strong demand but also helped by lack of labor disputes. Gales flattened an estimated three million cubic meters of timber in New Zealand's North Island earlier this year and this is likely to have an impact on the country's wood reserves for several years.

Australian mills were affected more severely by Asian competition and some strikes. Overall production was down about 5% from 1980.

LATIN AMERICA

PAPER AND PULP output in 1981 fell just below 1980 levels, ending the climb of recent years and marking a period of negligible economic growth, rocketing inflation, and political instability for many Latin American countries.

1981 was also a year in which negotiations began for the sale of one of the most daring pulp mill projects, Jari Florestal in Brazil. It was eventually bought by a consortium of 20 Brazilian companies, none with pulp or paper interests, so ending the 15-year involvement of American entrepreneur Daniel Ludwig.

Other major international projects were either shelved or cancelled, such as the decision by Japanese partners to give up on the Flonibra project, also in Brazil, which was supposed to eventually produce 600,000 tpy of bleached pulp from eucalyptus.

Total paper and board output in 1981 was 7.57 million metric tons, down 2.1%. The cause of the fall was the drop in Brazil's production—by far the largest producer—to 3.3 million tons, 160,000 tons below 1980. The other major producer, Mexico, bettered its 1980 output by 2.9% to 1.95 million tons. Of the other two countries producing more than 500,000 tpy, Argentina was 50,000 tons down on 1980 but Venezuelan mills marginally improved output to 518,000 tons.

Total annual paper/board capacity for Latin American countries is estimated at 9.57 million tons, from some 420 mills.

Latin American paper/board imports in 1981 were 1.82 million metric tons (same as 1980), while exports of 448,000 tons were up 20.8%.

Pulp output in 1981 was 5.79 million metric tons, down 1% from 1980. Brazil, however, maintained pulp production at the 1980 level at 3.5 million tons; and Mexico's output was up slightly at 740,000 tons. Production drops in Argentina and Chile were the main cause of the overall decrease. Chemical pulp output in Latin America in 1981 was down 1.3% at 4.29 million tons.

The continent's pulp trade balance improved by 13% even though both imports (770,000 metric tons) and exports (1.15 million tons) were lower than 1980. Annual pulp capacity in 1981 was 6.76 million tons, produced by about 130 mills.

AFRICA

AFRICAN PAPER AND board production rose in 1981 by 5.6% to 1.81 million metric tons, largely due to increased South African production. Any major change in Africa's output is likely to be caused by South Africa, which produces more than twice as much paper and board as the rest of the continent combined.

In 1981, South Africa recorded an increase in production of just under 90,000 metric tons, with newsprint output rising 80,000 tons and printing/writing grades rising by nearly 30,000 tons. There were small drops in some other grades.

One important addition was the startup of Zambia's first paper mill in mid-1981, which produced 16,000 metric tons. The country's first pulp mill is due to start in 1982, producing 14,000 tpy.

Based on available figures, total paper and board imports to Africa fell by about 2% to just under 900,000 metric tons in 1981, while exports rose by 22.1% to 200,000 tons. The continent's paper and board capacity was estimated to be nearly two million tons, produced by some 69 mills.

Africa's total pulp output in 1981 was 1.65 million metric tons, up 6.7% from 1980. South Africa was again the main producer with 1.12 million tons, an increase of over 100,000 tons.

In Cameroon, Cellulose du Cameroun's new Edea pulp mill produced its full 120,000 metric tpy of bleached kraft pulp for export in 1981. But in March 1982 an explosion destroyed the ClO$_2$ line. After a four-week closure, the mill restarted producing unbleached pulp. Full repair was expected to take several months.

Africa's pulp capacity is just under two million metric tons, produced by 29 mills. Pulp imports in 1981 were 270,000 tons, down 10.6%; and exports increased by 3.4% to 730,000 tons.

Over the last year there have been announcements of new small mills producing wastepaper-based paper or board. This development is reflected in a 31% increase in wastepaper consumption in 1981, reaching a total of 560,000 metric tons.

Further data on world's paper industry

Detailed data on world production, consumption, and pulp and paper industry economics is available in the 1982 Review Number published by our associate magazine, PULP & PAPER INTERNATIONAL (publication date July 25, 1982). Copies of this issue, which include individual reports for all producing countries, are $20 each.

To order, send payment (US$) to *PPI*, Circulation Dept. 500 Howard St., San Francisco, Calif. 94105.

REVIEW OF TOP 20 PRODUCING NATIONS

Abridged data on production and export/import trade are given for countries included in the Top 20 tables for paper and board production and pulp production (see page 50)

Australia

Population: 14,900,000. Per capita consumption of paper and board: 137 kg/ 308 lb. Paper and board mills: 17. Pulp mills: 16 (woodpulp, sulfate: 1; sulfite: 1; soda: 1; semichemical: 7; mechanical: 5; nonwood: 1)

Paper/board capacity: 1,730,000 e tons **Pulp capacity:** 875,000 e tons

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	1471	1394	747	741	119	90
Board	—	—	—	—	—	—
Total	**1471**	**1394**	**747**	**747**	**119**	**90**
Chemical woodpulp	490	442	271	252	na	na
Other pulps	223	219	5	2	na	na
Total	**713**	**661**	**276**	**254**	**na**	**na**

Austria

Population: 7,507,666. Per capita consumption of paper and board: 108 kg/ 238 lb. Paper and board mills: 36. Pulp mills: 22 (woodpulp, sulfate: 2; sulfite: 9; semichemical: 2; mechanical: 11)

Paper/board capacity: 1,911,000 tons **Pulp capacity:** 1,356,000 tons
Operating rate 1981: 87% **Operating rate 1981:** 89%

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	903	935	96	111	551	610
Board	713	736	89	95	412	440
Total	**1616**	**1671**	**185**	**206**	**963**	**1050**
Chemical woodpulp	887	861	157	186	245	250
Other pulps	342	349	23	15	9	12
Total	**1229**	**1210**	**180**	**201**	**254**	**262**

Brazil

Population: 122,000,000. Per capita consumption of paper and board: 29 kg/ 64 lb. Paper and board mills: 160. Pulp mills: 48.

Paper/board capacity: 4,000,000 tons **Pulp capacity:** 3,900,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	2253	2062	202	234	151	219
Board	1214	1228	0	0	23	78
Total	**3467**	**3290**	**202**	**234**	**174**	**297**
Chemical woodpulp	3082	2910	58	15	772	769
Other pulps	425	na	8	6	3	0
Total	**3507**	**3500e**	**66**	**21**	**775**	**763**

Canada

Population: 24,200,000. Per capita consumption of paper and board: 197 kg/ 443 lb. Paper and board mills: 112. Pulp mills: 36.

Paper/board capacity: 15,600,000 tons **Pulpcapacity:** 23,100,000tons
Operating rate 1981: 87% **Operating rate 1981:** 86%

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	11,045	11,255	194	274	8,625	8,753
Board	2344	2275	87	112	496	400
Total	**13,389**	**13,530**	**281**	**386**	**9121**	**9153**
Chemical woodpulp	12,125	11,370	87	77	6604	6076
Other pulps	7819	7905	53	60	585	515
Total	**19,944**	**19,275**	**140**	**137**	**7189**	**6591**

Chile

Population: 11,390,000. Per capita consumption of paper and board: 25 kg/ 56 lb. Paper and board mills: 18. Pulp mills: 7 (woodpulp, sulfate: 3; sulfite: 1; mechanical: 3)

Paper/board capacity: 379,100 tons **Pulp capacity:** 813,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	303	300	48	52	79	55
Board	24	19	7	7	5	na
Total	**327**	**319**	**55**	**59**	**84**	**55**
Chemical woodpulp	633	618	—	—	436	384
Other pulps	131	125	—	—	—	—
Total	**764**	**743**	**—**	**—**	**436**	**384**

China, People's Rep. of

Population: 988,000,000. Per capita consumption of paper and board: 5.5 kg/ 12 lb. Paper and board mills: 1,600e

Paper/board capacity: 6,300,000 tons **Pulp capacity:** 5,600,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	3410	3260	135	na	na	na
Board	1940	2140	575	na	na	na
Total	**5350**	**5400**	**710**	**na**	**178**	**192**
Chemical woodpulp	3380	3250	na	na	—	—
Other pulps	1110	1060	na	na	—	—
Total	**4490**	**4310**	**418**	**na**	**—**	**—**

Czechoslovakia

Population: 15,450,000. Per capita consumption of paper and board: 75 kg/ 165 lb. Paper and board mills: 49. Pulp mills: 24 (woodpulp, sulfate: 5; sulfite: 7; semichemical: 1; mechanical: 10; nonwood: 1)

Paper/board capacity: 1,282,000 tons **Pulp capacity:** 1,031,000 tons
Operating rate 1981: 96% **Operating rate 1981:** 85%

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	689	686	49	48	98	111
Board	335	539	82	78	66	80
Total	**1024**	**1225**	**131**	**126**	**164**	**191**
Chemical woodpulp	625	645	87	84	9	9
Other pulps	228	235	27	26	4	4
Total	**853**	**880**	**114**	**110**	**13**	**13**

Finland

Population: 4,800,000. Per capita consumption of paper and board: 198 kg/ 437 lb. Paper and board mills: 46. Pulp mills: 52 (woodpulp, sulfate: 18; sulfite: 9; semichemical: 3; mechanical: 22)

Paper/board capacity: 7,025,000 tons **Pulp capacity:** 8,510,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	4493	4618	11	13	3688	3694
Board	1426	1517	29	29	1104	1141
Total	**5919**	**6135**	**40**	**42**	**4792**	**4835**
Chemical woodpulp	4590	4545	5	8	1732	1494
Other pulps	2644	2786	31	28	207	191
Total	**7234**	**7331**	**36**	**36**	**1939**	**1685**

France

Population: 54,000,000. Per capita consumption of paper and board: 115 kg/ 259 lb. Paper and board mills: 172. Pulp mills: 28 (woodpulp, sulfate: 8; sulfite: 4; semichemical and mechanical: 16)

Paper/board capacity: 5,500,000 tons **Pulp capacity:** 2,000,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	3199	3170	1342	1425	811	844
Board	1954	1978	788	749	249	245
Total	**5153**	**5148**	**2130**	**2174**	**1060**	**1089**
Chemical woodpulp	1396	1301	1591	1585	169	149
Other pulps	433	415	61	66	3	4
Total	**1829**	**1716**	**1652**	**1651**	**172**	**153**

Fed. Rep. of Germany

Population: 61,666,000. Per capita consumption of paper and board: 157 kg/ 353 lb. Paper and board mills: 200. Pulp mills: 37 (woodpulp, sulfite: 11; semi-chemical: 1; mechanical: 25)

Paper/board capacity: 10,028,000 tons **Pulp capacity:** 2,322,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	4758	4938	2592	2608	1117	1296
Board	2822	2857	1179	1124	592	646
Total	**7580**	**7795**	**3771**	**3732**	**1709**	**1942**
Chemical woodpulp	691	642	2237	2238	77	74
Other pulps	1304	1379	209	186	33	37
Total	**1995**	**2021**	**2446**	**2424**	**110**	**111**

Italy

Population: 57,180,422. Per capita consumption of paper and board: 87 kg/ 192 lb. Paper and board mills: 480. Pulp mills: 55 (sulfite: 2; semichemical: 5; mechanical: 28; nonwood: 20)

Paper/board capacity: 5,850,000 tons **Pulp capacity:** 1,350,000 tons
Operating rate 1981: 83% **Operating rate 1981:** 71%

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	2971	2933	782	792	533	654
Board	1964	1911	211	175	151	167
Total	**4935**	**4844**	**993**	**967**	**684**	**821**
Chemical woodpulp	167	189	1518	1397	8	12
Other pulps	908	773	107	72	1	—
Total	**1075e**	**962**	**1625**	**1469**	**9**	**12**

Japan

Population: 117,690,000. Per capita consumption of paper and board: 143 kg/ 321 lb. Paper and board mills: 593. Pulp mills: 68 (woodpulp, sulfate: 38; sulfite: 7; soda: 0; semichemical: 13; mechanical: 20; nonwood: 1)

Paper/board capacity: 22,473,000 tons **Pulp capacity:** 12,786,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	10,536	9,944	245	250	307	360
Board	7552	7037	248	239	348	314
Total	**18,088**	**16,981**	**493**	**489**	**655**	**674**
Chemical woodpulp	7157	6272	1550	1176	99	103
Other pulps	2631	2,338	667	522	1	1
Total	**9788**	**8610**	**2,217**	**1,866**	**100**	**104**

Korea, Rep. of

Population: 38,723,000. Per capita consumption of paper and board: 42 kg/ 93 lb. Paper and board mills: 170e. Pulp mills: 5 (sulfate: 1; mechanical: 4)

Paper/board capacity: 2,180,000e tons **Pulp capacity:** 314,000 tons
Operating rate 1981: 82e% **Operating rate 1981:** 71%

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	894	899	10	23	80	105
Board	799	885	13	13	74	76
Total	**1693**	**1784**	**23**	**36**	**154**	**181**
Chemical woodpulp	48	85	404	447	—	—
Other pulps	137	137	64	74	—	—
Total	**185**	**222**	**468**	**521**	**—**	**—**

Mexico

Population: 70,000,000. Per capita consumption of paper and board: 36 kg/ 79 lb. Paper and board mills: 60. Pulp mills: 27 (woodpulp, sulfate: 11; sulfite: 1; mechanical: 1, nonwood: 14)

Paper/board capacity: 2,556,000 tons **Pulp capacity:** 992,500 tons
Operating rate 1981: 76% **Operating rate 1981:** 75%

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	1011	1075	312	461	—	—
Board	884	875	284	150	—	—
Total	**1895**	**1950**	**596**	**611**	**—**	**—**
Chemical woodpulp	396	408	164	76	—	—
Other pulps	335	335	44	46	—	—
Total	**731**	**743**	**208**	**122**	**—**	**—**

Netherlands

Population: 14,246,000. Per capita consumption of paper and board: 154 kg/ 340 lb. Paper and board mills: 35. Pulp mills: 5 (mechanical: 4; nonwood: 1)

Paper/board capacity: 1,880,000 tons **Pulp capacity:** 212,000 tons
Operating rate 1981: 91% **Operating rate 1981:** 77%

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	868	820	846	830	473	466
Board	846	863	538	553	424	407
Total	**1714**	**1683**	**1384**	**1383**	**897**	**873**
Chemical woodpulp	—	—	564	515	9	3
Other pulps	206	162	60	45	7	1
Total	**206**	**162**	**624**	**560**	**16**	**14**

New Zealand

Population: 3,195,800. Per capita consumption of paper and board: 135 kg/ 304 lb. Paper and board mills: 5. Pulp mills: 6 (woodpulp, sulfate: 2; semichemical: 2; mechanical: 5)

Paper/board capacity: 797,632 tons **Pulp capacity:** 1,384,861 tons
Operating rate 1981: 89% **Operating rate 1981:** 84%

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	491	510	39	41	323	315
Board	192	201	—	—	—	—
Total	**683**	**711**	**39**	**41**	**323**	**315**
Chemical woodpulp	569	619	11	6	217	245
Other pulps	578	541	—	—	258	269
Total	**1147**	**1160**	**11**	**6**	**475**	**514**

Norway

Population: 4,093,000. Per capita consumption of paper and board: 141 kg/ 311 lb. Paper and board mills: 23. Pulp mills: 27 (sulfate: 2; sulfite: 4; semichemical: 2; mechanical: 19)

Paper/board capacity: 1,650,000 tons **Pulp capacity:** 1,945,000 tons
Operating rate 1981: 83% **Operating rate 1981:** 83%

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	1205	1233	98	74	938	924
Board	170	140	69	80	105	91
Total	**1375**	**1373**	**167**	**154**	**1043**	**1015**
Chemical woodpulp	455	563	202	278	63	141
Other pulps	1039	1045	4	5	308	297
Total	**1494**	**1608**	**206**	**283**	**371**	**438**

Portugal

Population: 9,905,000. Per capita consumption of paper and board: 51 kg/ 112 lb. Paper and board mills: 108. Pulp mills: 8 (sulfate, 5; sulfite, 2; soda, 1)

Paper/board capacity: 650,000 tons **Pulp capacity:** 1,000,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	360	388	40	46	16	22
Board	175	181	24	30	131	122
Total	**535**	**568**	**64**	**76**	**147**	**144**
Chemical woodpulp	832	853	24	23	434	455
Other pulps	33	42	6	1	—	—
Total	**865**	**895**	**30**	**24**	**434**	**455**

Romania

Population: 22,000,000. Per capita consumption of paper and board: 32 kg/ 72 lb. Paper and board mills: 20. Pulp mills: 11 (woodpulp, sulfate: 6; sulfite: 3; semichemical: 1; mechanical: 1; nonwood: 4)

Paper/board capacity: 870,000 tons **Pulp capacity:** 850,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	305	305e	na	na	na	na
Board	500*	500e*	na	na	na	na
Total	**805**	**805e**	**46**	**46e**	**167**	**167e**
Chemical woodpulp	645	645e	na	na	na	na
Other pulps	170	170e	na	na	na	na
Total	**815**	**815e**	**60**	**60e**	**26**	**26e**

*Board figures include packaging paper

South Africa

Population: 29,360,000. Per capita consumption of paper and board: 45 kg/ 101 lb. Paper and board mills: 16. Pulp mills: 10 (woodpulp, sulfate: 2; sulfite: 1; soda: 1; semichemical: 2; mechanical: 2; nonwood: 2)

Paper/board capacity: 1,321,000 tons **Pulp capacity:** 1,193,000 tons

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	634	723	164	174	101	135
Board	566	565	89	80	38	39
Total	**1200**	**1288**	**253**	**254**	**139**	**174**
Chemical woodpulp	432	433	180	207	25	23
Other pulps	580	689	—	1	327	363
Total	**1012**	**1122**	**180**	**208**	**352**	**386**

Spain

Population: 37,500,000. Per capita consumption of paper and board: 70 kg/ 154 lb. Paper and board mills: 212. Pulp mills: 35 (sulfate, 14; sulfite, 1; semi-chemical, 1; mechanical, 10; nonwood, 10)

Paper/board capacity: 3,108,000 tons **Pulp capacity:** 1,652,000 tons
Operating rate 1981: 83% **Operating rate 1981:** 84%

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	1415	1422	248	261	147	195
Board	1151	1166	119	90	117	115
Total	**2566**	**2588**	**367**	**351**	**264**	**310**
Chemical woodpulp	1113	1142	262	238	175	175
Other pulps	216	222	10	3	10	8
Total	**1329**	**1364**	**272**	**241**	**185**	**183**

Sweden

Population: 8,330,000. Per capita consumptinn of paper and board: 200 kg/ 441 lb. Paper and board mills: 58. Pulp mills: 64 (sulfate, 28, sulfite, 13; semi-chemical, 2; mechanical, 21)

Paper/board capacity: 6,860,000 tons **Pulp capacity:** 9,625,000 tons
Operating rate 1981: 85.2% **Operating rate 1981:** 80.7%

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	3931	3931	123	124	2649	2918
Board	2258	2220	54	55	1675	1704
Total	**6189**	**6131**	**177**	**179**	**4324**	**4622**
Chemical woodpulp	6617	6531	44	68	2532	2442
Other pulps	2082	1998	1	10	449	380
Total	**8699**	**8529**	**45**	**78**	**2981**	**2822**

Taiwan

Population: 18,100,000. Per capita consumption of paper and board: 78 kg/ 176 lb. Paper and board mills: 160. Market pulp mills: 3 (sulfate, 1; nonwood, 2)

Paper/board capacity: 1,900,000 tons **Pulp capacity:** 450,000 tons
Operating rate 1981: 79% **Operating rate 1981:** 84%

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	522	532	54	55	36	42
Board	927	966	26	21	111	129
Total	**1449**	**1498**	**80**	**76**	**147**	**171**
Chemical woodpulp	190	257	72	79	39	87
Other pulps	86	93	10	5	15	12
Total	**276**	**350**	**82**	**84**	**54**	**99**

U.S.S.R.

Population: 268,800,000. Per capita consumption of paper and board: 33 kg/ 73 lb. Paper and board mills: 84. Pulp mills: 56)

Paper/board capacity: 10,000,000 tons **Pulp capacity:** 8,450,000 tons
Operating rate 1981: 90% **Operating rate 1981:** 85%

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	5294	5401	679	730	646	670
Board	3446	3555	214	270	372	380
Total	**8740**	**8956**	**893**	**1000**	**1018**	**1050**
Chemical woodpulp	7100	7160	—	—	823	945
Other pulps	1850	1900	—	—	—	—
Total	**8950**	**9060**	**—**	**—**	**823**	**945**

United Kingdom

Population: 55,950,000. Per capita consumption of paper and board: 124 kg/ 273 lb. Paper and board mills: 117. Pulp mills: 3 (semichemical, 2; mechanical, 1)

Paper/board capacity: 3,900,000 tons **Pulp capacity:** 180,000 tons
Operating rate 1981: 87% **Operating rate 1981:** 81%

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	2177	1847	2647	—	402	—
Board	1616	1534	863	—	64	—
Total	**3793**	**3381**	**3510**	**—**	**466**	**—**
Chemical woodpulp	122	50	1393	1351	4	—
Other pulps	164	90	195	205	1	—
Total	**286**	**140**	**1588**	**1556**	**5**	**—**

United States

Population: 229,700,000. Per capita consumption of paper and board: 268 kg/591 lb. Paper and board mills: 612. Pulp mills: 248 (woodpulp, sulfate: 126; sulfite: 22; semichemical: 43; mechanical: 96)

Paper/board capacity: 66,007,000 tons **Pulpcapacity:** 52,980,000tons
Operating rate 1981: 91% **Operating rate 1981:** 94%

(000 metric tons)

	Production		Imports		Exports	
	1980	1981	1980	1981	1980	1981
Paper	28,631	29,198	7756	7322	852	936
Board	28,205	28,567	91	120	3281	2681
Total	**56,836**	**57,765**	**7847**	**7442**	**4133**	**3617**
Chemical woodpulp	40,333	41,094	3279	3316	2681	2619
Other pulps	5,692	6,065	396	391	771	718
Total	**46,025**	**47,195**	**3675**	**3707**	**3452**	**3337**

B.C. chip exports slowed by industry slump and new technology in Japan

Effects of the slowdown on Fibreco, a major chip exporter with a 900,000-tpy ship-loading facility in Vancouver, B.C., are examined in this article

By GARY E. NASH

□ In August 1979, Fibreco Export Inc. began operating Canada's largest chip export facility, a C$16-million project located in North Vancouver, B.C. Committed to long-term contracts to supply chips to Japan, this pre-recession venture began operations optimistic that the facility could capitalize on the burgeoning Japanese demand for imported chips by specializing in shipments of whitewood chips for TMP. This article reports the progress of Fibreco, which now finds itself caught between uncertain world economics and changing technology.

The B.C. chip export opportunity actually began in the late 1960s when the provincial government began efforts to encourage investors to build pulp mills in the interior of the province. Since there were not enough chips to support pulp expansions at the time, the provincial government had to take steps to ensure adequate supplies of fiber for these proposed expansions.

This prompted changes in government wood harvest and utilization standards. Sawmills were granted increased timber harvests, but in addition to producing lumber, they also have to make chips for pulp mills.

As sawmills became proficient at producing chips along with lumber, the supply of chips outstripped demand, and sawmills were faced with a surplus of chips they could not use. The provincial government was subsequently called upon to find a solution to this problem.

A study was conducted, and the results indicated that export markets should be sought to dispose of the surplus chips. To clear the way for chip shipments, an existing export tax on chips was removed and a policy of granting permits for long-term contracts was established.

With trade restrictions removed, a potentially lucrative export market for B.C.'s whitewood spruce chips to Japan and Europe opened up. In both areas, the paper industry had made heavy commitment in TMP mills. If these mills could obtain a high whitewood spruce content furnish, bleaching requirements would be minimized and they could produce a lightweight newsprint more competitively.

At that time, B.C. was essentially the only supplier able to meet the Japanese and European needs. Some whitewood chips were available from New Zealand, but quantities were limited. Siberia was also a potential source of fiber, but these chips were not available for export, and exports from the U.S. West Coast were primarily made up of redwood and Douglas fir chips.

Since most of B.C.'s chips were produced by a large number of small sawmills scattered throughout the interior of the province—none of which could engage in long-term, noninterruptible contracts—a gathering grid had to be formed to stockpile and market the chips. From this emerged the concept of Fibreco, an export marketing company made up of more than 40 independent smaller companies with each company committing a specified portion of their chip production to export through the parent organization.

Using a mobile shiploader (Rader), an average vessel can be loaded in about 24 hours. Fibreco began loading chips for Japan in Aug. 1979.

Mr. Nash is sales promotion coordinator, Rader Companies Inc., Portland, Ore.

System description

The Fibreco terminal is one of the most modern and efficient chip export terminals in the world. It has storage capacity of 75,000 bone-dry chip units (1 bdu = 2400 lb) and an annual handling capacity of ten times that amount. Covering a 23-acre site along Burrard Inlet in North Vancouver, the facility can receive chips by water, rail, and highway carriers.

A sophisticated mobile shiploader that can load at rates to 1200 tons/hour is used by Fibreco. The operator (in the cab at the end of the loading boom) can maneuver the boom and loading head for maximum load compaction and uniformity.

The bulk of the chips is received from Fibreco's member sawmills by railcar. They are unloaded by a FMC Link-Belt rotary railcar dumper into a deep hopper. From the receiving hopper, chips move via a Rader pneumatic system to a screening station at a transfer tower in the storage area. There the chips are screened, and oversized chips are rechipped. Processed material is belt-conveyed to one of three stations, each of which can store up to 650 tons/hour using a Rader Belt Pile Builder.

At dockside, the chips are loaded into the ship by a Rader mobile shiploader, the largest of its kind in the world. The shiploader is mounted on steel wheels and can travel the length of the dock to reposition after filling a hold. This eliminates having to move the ship during loading and permits a more balanced vessel loading. The shiploader is fully articulated and can raise, lower, and swing its boom to place chips in the hold. Chips are pneumatically loaded at rates to 1200 tons/hour. From a control cab located on the loading boom, the operator has good visibility over the hold and can easily direct the loading head to fill all corners of the hold.

The facility can receive ships with a draught of up to 38 ft (11.5 m). A large vessel can normally be loaded within a 24-hour period. Size of ships vary from 7000- to 13,000-bdu capacity.

The first year

Fibreco began operating in 1979 with long-term, non-interruptible contracts to supply Japan with 400,000 bdu of chips annually for the next ten years. At the same time, European buyers were offering to purchase a portion of the remaining chips available in contracts that would amount to C$27 million/year. The Japanese contracts, and the prospects of committing the balance of Fi-

Table 1. **Pulpwood imports to Japan by origin and species, 1965-79**
(1000 m³)

Year	U.S	U.S.S.R.	Southeast Asia/other: Australia	Malaysia	New Zealand	Indonesia	Other	Total	Grand total	% imports in total pulpwood
1965										
Softwood	253	142	—	na	—	na	na	22	417	5
Hardwood	—	25	—	na	—	na	na	19	44	—
Total	253	167	—	26	—	9	6	41	461	3
1970										
Softwood	4072	143	—	—	153	—	30	183	4398	37
Hardwood	18	113	—	572	5	25	153	755	886	5
Total	4090	256	—	572	158	25	183	938	5284	19
1975										
Softwood	7103	464	—	—	358	—	—	358	7925	56
Hardwood	430	259	2033	702	31	88	323	3117	3866	26
Total	7533	723	2033	702	389	88	323	3535	11,791	41
1977										
Softwood	8114	588	—	—	388	—	—	388	9090	57
Hardwood	636	302	2830	435	33	59	552	3909	4847	30
Total	8750	890	2830	435	421	59	552	4297	13,937	44
1978										
Softwood	6905	629	—	—	400	—	871	1271	8805	56
Hardwood	352	301	2720	434	56	83	578	3871	4524	29
Total	7257	930	2720	434	456	83	1449	5142	13,329	43
1979										
Softwood	7783	598	—	—	389	—	837	1226	9607	55
Hardwood	624	204	3315	281	114	163	546	4419	5247	32
Total	8407	802	3315	281	503	163	1383	5645	14,854	44

Source: PULP & PAPER INTERNATIONAL, Feb. 1981

breco's annual throughput to other interested buyers, were the backbone of the new export venture.

Japanese commitments were of particular significance since Japan depends heavily on imported wood to support its pulp and paper industry, with about half of all pulpwood used there coming from offshore. By the end of 1979, Japan was already receiving more than 5 million units of pulpwood from exporters—about half in the form of woodchips. Of this imported fiber, 65% was softwood chips, the market segment Fibreco was looking to tap—especially those used for newsprint.

At the time, worldwide newsprint demand had steadily increased from its low point in mid-1975. Japan mirrored this demand, closing 1979 with 80% increased capacity in the newsprint, uncoated printing paper, and coated paper sectors. Mechanical pulp had become the growing mainstay of that capacity. By the end of the decade, almost one-fifth of Japan's pulping capacity was dedicated to mechanical pulp, of which TMP was a major contributor. Three-quarters of a million tons of TMP capacity was on-line—95% of it committed to newsprint.

Fibreco had much to gain from these trends in pulp and papermaking. TMP greatly favors the western Canadian chip supply, which has a high content of western white spruce along with pine and white fir. Mechanical pulp from these species, depending on end-product requirements, requires little or no bleaching and reduced amounts of added chemical pulp to be suitable for a variety of paper grades. This gave Fibreco the leverage it needed to secure long-term contracts.

Besides finding a ready supply of a preferred species, however, Japanese importers had another reason for wanting access to B.C. chips. Nearly 60% of their softwood needs were supplied by imports in 1979, of which 80% came from a single source—the U.S. West Coast. This single source had dominated Japanese imports for a decade, carrying considerable sway over chip prices and availability. A Japanese government advisory board was forecasting growth in production capacity for paper and board to reach 29 million tons by 1990 (more than a 40% increase over the start of the decade), which dictated a broadening of the industry's supply base to lessen the risk of local economies controlling its fiber supply. The wisdom of that strategy was borne out in less than 18 months, when soaring energy costs affecting U.S. chip producers combined with a tight supply were responsible for higher prices for export chips, causing a ripple effect throughout the Japanese pulp and paper community.

Under the terms of Fibreco's contract with five Japanese importers, 300,000 bdu were to be shipped the first year, 1980, and 400,000 bdu were to be shipped annually for the remainder of the contract period. The first year's shipments went according to forecasts. However, by the fourth quarter of that year Fibreco began to receive signals of a slackening demand for its chips. Japan was beginning to feel the effects of what was later to be viewed as that country's worst national depression since the end of the war. Paper production was running at more than 20% over demand, and the industry was forced to adjust inventories, cut production, and reevaluate strategies.

By the end of its second year of operation, expected shipments from Fibreco fell short. And by mid-1982 they had dropped to 60% of those forecasted.

The future

Over the short term, Fibreco's prospects remain uncertain. Anticipated shipments are down, and how soon they will pick up can only be forecast with the broadest of hedges. Despite this uncertainty, Fibreco's CEO, Hugh Cooper, remains optimistic.

"Over the long term," says Cooper, "natural growth in the market will mean that the contracted amounts will still be needed. It's just a matter of time."

At the same time, Cooper is investigating other markets for B.C. chips. Trial shipments to Sweden and France have been made. Other potential markets include central South America, South Korea, and Taiwan.

Meanwhile, new developments will continue to increase competition for chip buyers. Japanese papermakers, for example, plan to use more deinked pulp, which will reduce virgin fiber requirements to some extent. They have also made improvements in the area of groundwood pulping (see PULP & PAPER, August 1981, page 128), which give greater flexibility in fiber usage. Canada, the U.S., and Europe are making similar progress in the area of improved fiber utilization. Joint pulp and paper ventures away from Japan provide another means of limiting dependence on outside chip and/or pulp suppliers to support domestic production. □

Fibreco's storage yard, located on Burrard Inlet in North Vancouver, will hold 75,000 bdu. Chips are received from more than 40 member companies throughout B.C.

Table 2. **Worldwide TMP installations, 1978-1981**

	Canada	U.S.	Sweden	Finland	Japan	Other	Total	Production increase (a.d. metric tpd)	Total production (a.d. metric tpd)
1978	17	26	13	6	9	30	101	5060	21,000
1979	25	28	14	10	11	36	124	7547	28,608
1980	50	58	24	22	21	71	246	2980	31,587
1981	56	60	26	22	22	75	261	5496	37,083

Source: Ray Leask, The Ontario Paper Co. Ltd.

North American pulp and paper export prospects still bright

Fiber, capital constraints slow world-capacity growth, leaving low-cost U.S. producers in strong position to supply export markets for pulp and linerboard

PULP & PAPER STAFF REPORT

☐ Although export markets have been hard-hit by the strong U.S. dollar and world recession, longer-run prospects for North American pulp and paper exports overseas remain bright, industry speakers told a Forest Products Seminar sponsored by the Financial Analysts Federation and held June 15 and 16 in Portland, Ore.

Limited world capacity growth (due to wood and capital constraints) should cause many regions of the world to turn increasingly to low-cost North American producers for such commodities as linerboard and market pulp, although growth of white paper and newsprint exports may be slower, due to excess capacity overseas.

According to **Thomas P. Clephane**, of Morgan Stanley & Co., who chaired the export panel, overall U.S. pulp and paper shipments overseas should grow at around 6% average annual rate over the next decade—roughly twice that of domestic demand.

Pulp market seen nearing bottom

The pulp market is near the bottom of the trough and

Table 1. **World chemical paper-grade market pulp capacity, potential production and demand**
(000 metric tons)

	1980		1981		1982	1983	1984
Capacity	**Capacity**	**Production**	**Capacity**	**Production**	**Capacity**	**Capacity**	**Capacity**
Canada[1]	6690	6605	6810	6080	6810	6960	7080
U.S.[1]	4655	4455	4900	4400	4940	5020	5115
Nordic countries[1]	5985	5040	6130	4985	5965	5790	5800
N. America/Nordic total	**17,330**	**16,100**	**17,840**	**15,464**	**17,715**	**17,770**	**17,995**
Western Europe[1]	2560	2405	2565	n.a.	2715	2770	n.a.
Latin America[1]	2025	1880	1930	n.a.	1935	2055	n.a.
Japan[1]	1070	910	1070	n.a.	1070	1070	n.a.
Others[1]	955	870	1140	n.a.	1245	1195	n.a.
Total	**23,940**	**22,165**	**24,545**		**24,680**	**24,860**	
Potential production total	**22,264**		**22,830**		**23,602**	**23,101**	
Demand	**Actual**		**Actual**		**Estimated**	**Estimated**	
Canada	735		750		700	750	
U.S.	4430		4325		4260	4500	
Nordic countries	1025		930		875	875	
Western Europe	9135		9010		9060	9400	
Eastern Europe	470		380		350	345	
Latin America	1190		865		875	950	
Japan	2335		1800		1825	2050	
Oceania	335		315		325	340	
Asia/Africa	1775		2095		2025	2275	
Total	**21,430**		**20,470**		**20,295**	**21,485**	
Ratio							
Demand/potential production	**96%**		**90%**		**86%**	**93%**	

1. Potential production = 95% of capacity for Canada, U.S. and Nordic; 90% for Western Europe and Japan; 85% for Latin America and others
n.a. = not available
Source: American Paper Institute

will shortly see a turnaround with low world-capacity growth contributing to a tightening market over the next several years, particularly for bleached northern softwood kraft, said **Fred G. Robertson**, president of Mead Pulp Sales Inc.

Although North American and Scandinavian producer inventories reached 1.8 million metric tons at the end of April, this is not substantially above the generally accepted "normal" level of 1.3 to 1.5 million tons, and is considerably below the all-time high of 2.9 million tons reached in February 1977, while inventories in the hands of pulp consumers are low, he pointed out.

"When the large, integrated U.S. paper manufacturers are running full, using all their own pulp and buying more in the marketplace, the world market pulp supply/demand equation tightens up in a hurry," Robertson said. "Following the rundown of inventories in 1977-78, the North American and Nordic mills ran at an average of better than 96% of potential production for the next three years. Prices were increased for seven consecutive quarters beginning with the fourth quarter of 1978 and continuing through the second quarter of 1980 for an aggregate of $200/ton, or more than 60%."

World chemical paper-grade pulp capacity has been estimated at 24.68 metric million tons by a joint committee of North American and Nordic paper associations. By 1983, capacity is only expected to be 1.3% higher than it was in 1981, Robertson noted.

In the major producing areas of North America and Scandinavia, representing about 72% of total world capacity, a 0.5% decline is expected over the same 1981-83 period, while through 1984 the increase will amount to less than 1.0%.

"These nominal growth rates are not surprising in view of the virtual nonavailability of long-term capital at affordable rates," Robertson said. And because of the need for companies to improve liquidity and difficulty in justifying new investment at current pulp price levels, Robertson finds it "difficult to believe that construction of many new market pulp mills will begin during the next three or four years."

Canadian market-pulp capacity is expected to grow by only 4%, or 270,000 tons, between 1981-84, with future wood availability posing a major problem to further expansion, he noted (see Table 1). U.S. market-pulp capacity is expected to grow by 4% over the three-year period, reaching 5.1 million tons in 1984. While the wood supply is not yet a problem in the South, recent expansion has emphasized integrated pulp/paper operations.

In the Nordic countries, capacity is expected to decline by 5% from 6.1 million tons in 1981 to 5.8 million tons in 1984 due to fiber constraints and emphasis on producing higher value paper grades.

Although the Russians have recently been exporting aggressively to raise hard currency, shipments to Western Europe are not expected to increase much above their 1980 level of 185,000 tons, according to Robertson. Offsetting this is 210,000 tons imported from the three Nordic countries, not to mention substantial paper and board shipments from Finland.

Brazil has become a significant factor in the bleached hardwood pulp market, with 1981 exports of 756,000 tons accounting for 22% of the 3.4 million tons exported by all major hardwood producers in the world—the largest share of any country. Acceptance of eucalyptus fiber is shown by the fact that total production of this grade in Brazil, Spain, Portugal and Morocco grew from 12% of North American and Scandinavian hardwood pulp output to more than 60% in 1980 and 1981, the Mead executive noted. However, observers doubt that there will be much new market-pulp capacity added in Brazil until the end of the 1980s.

Table 2. **Estimated average costs of producing bleached kraft paper-grade market pulp**
(U.S.$/a.d. metric ton)

Softwood	**First half 1982**	**First half 1981**
Western Canada	(.8008 C$/U.S.$)	(.8375 C$/U.S.$)
Fiber	$138	$138
Chemicals	37	32
Wages and salaries	55	49
Energy	38	—
Other direct	37	70*
Total direct	305	289
Interest	24	25
Depreciation	16	16
Other indirect	12	12
Total	**357**	**357**
Sweden	(5.90 Skr/U.S.$)	(5.54 Skr/U.S.$)
Fiber	212	189
Wages and salaries	85	78
Energy and chemicals	85	87
Total direct	382	354
Capital and misc.	101	99
Total	**483**	**453**
U.S. South		
Fiber	116	108
Chemicals	45	43
Wages and salaries	58	54
Energy	41	46
Other direct	47	43
Total direct	307	294
Interest	20	20
Depreciation	18	18
Other indirect	17	17
Total	**362**	**349**
Hardwood		
Brazil	(160.686cruz/U.S.$)	(93.96cruz/U.S.$)
Fiber	60	43
Labor	29	32
Energy	25	22
Chemicals	36	25
Total direct	150	122
Supplies, capital, misc.	177	191
Total	**327**	**313**
U.S. South		
Fiber	101	96
Chemicals	32	30
Wages and salaries	58	55
Energy	51	64
Other direct	46	42
Total direct	288	287
Interest	20	20
Depreciation	18	18
Other indirect	17	17
Total	**343**	**342**

*Includes energy
Source: Mead Corp. estimates

North America still has cost edge

The North American and Scandinavian industry will operate at an average of 82% of capacity and 88% of po-

tential production this year followed by 86% of capacity and 93% of potential production in 1983, the joint international committee has estimated (see Table 1). Some forecasters have estimated that the world market pulp industry will be operating at practical maximum capacity by 1984, Robertson noted.

Bleached northern softwood kraft supply will be in particularly tight supply, and one prominent forecasting firm has estimated that by 1987 the price could reach $960/ton, almost double current levels.

"Canada and the U.S. South are the most cost-effective regions for softwood pulp production, while Brazil is the leader in hardwood production with excellent quality and competitive costs," according to Robertson.

He estimated average production costs of producing bleached softwood kraft in the first half of 1982 at $357/metric ton in western Canada, $362 in the U.S. South, $420 in Chile, $462 in Finland, and $483 in Sweden. Bleached hardwood kraft production costs range from $327 in Brazil and $329 in Portugal, to $343 in the U.S. South and $385 in Finland, to $521 in Japan (detailed breakdowns for some countries are in Table 2).

These are average costs for existing mills, based on a wide range for interest, depreciation, and other indirect costs. In the U.S. and Canada the difference between higher-cost new facilities and fully depreciated older mills, which cost less to build, can range up to up to $100/ton, depending on the particular mill, Robertson said.

Slower linerboard growth seen in 1980s

World growth in demand for linerboard for all uses will decline in the 1980s to a 3% average annual rate vs 4% in the 1970s, according to **Carl W. Geist Jr.**, vice president containerboard, Weyerhaeuser Co.

Most of this decline is due to an expected reduction in rates of growth for real GNP, with Japan averaging about 5%, the U.S. 2.5%, and Western Europe about 2% in the 1980s, he said.

Some "structural" changes that will reduce the ratio of growth in linerboard demand to that of GNP include the expansion of services as a percentage of total economic activity in the U.S., Europe, and Japan, and a shift in manufacturing to heavier capital goods in countries such as Korea.

There will be some shifting in importance of various regional markets, with the U.S. share of total liner demand declining from 50% in 1980 to 49% in 1990 and Western Europe's declining from 25% to 22%. Pacific Rim and Japan's demand, however, will rise from 18% in 1980 to 20% in 1990—providing a market nearly equal in size to that of Western Europe by the end of the decade, Geist said.

The U.S. is not only the major user of kraft linerboard, but also the major supplier, accounting for about 75% of total world capacity—down from 80% in 1960 and 1970—but its percentage share will probably rise in the future.

Much of the capacity growth in the early 1970s took place outside the U.S. in response to the strong economic growth of the 1960s, but proved excessive after the oil-price increase of 1974 and subsequent reductions in world economic growth, according to Geist.

This capacity overhang has contributed to the current depressed state of the world linerboard market. But in some cases, this is being corrected by outright business failure (Labrador Linerboard in Canada and Vita Mayer in Italy). Excessive expansion in Japan has led to severely depressed industry conditions and a government-coordinated freeze on capacity with an actual permanent 15% decrease in total in-place linerboard capacity.

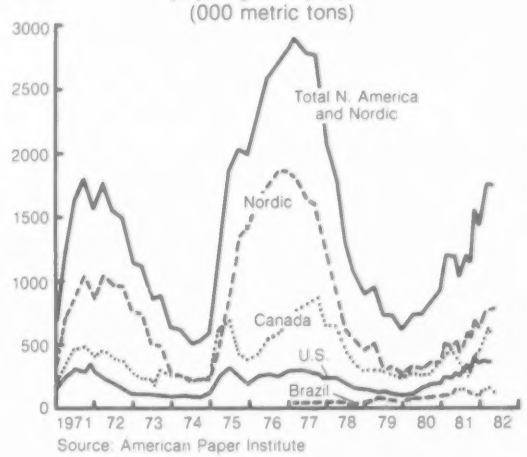
"Such changes clearly will be of benefit as more realistic appraisal of market potential and a greater awareness of constraints produces financially more responsible planning in this segment of the industry," Geist said.

"Linerboard demand grew rapidly at a time when softwood lumber consumption in the U.S., Japan, and Western Europe was also growing rapidly," Geist said. "Thus, a major softwood-chip-consuming product boomed at a time when sawmills were producing increasingly large volumes of chips—and these surplus chips were plentiful, cheap, and looking for a big home. Linerboard gave it to them."

In Sweden, for example, kraft linerboard capacity increases between 1965-75 were large, with residual consumption rising from 3.8 to 8.8 million m^3 log equivalent in eight years. But total pulpwood harvest, which rose from 21.8 million m^3 in 1972 to 27.2 million m^3 in 1974, could not be sustained, while roundwood and residuals rose sharply in price.

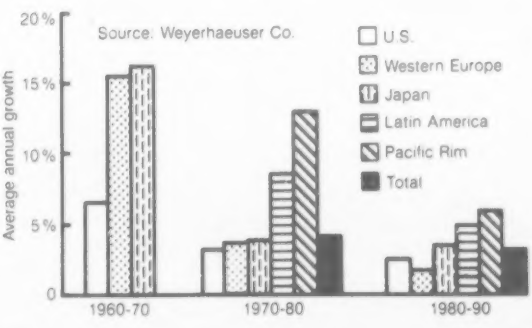
Lumber production during the 1980s is likely to be

Figure 1. **Producers' market inventories of chemical paper-grade pulps**
(000 metric tons)



Source: American Paper Institute

Figure 2. **Linerboard demand growth in selected markets**



lower in Western Europe, Japan, and the U.S., making increased use of roundwood necessary and placing constraints on further expansion. "In addition, capital productivity and economies of scale aren't providing the same boost that they did in the past," Geist said.

Linerboard consumption in Western Europe will grow from slightly under 7 million short tons in 1980 to a little over 8 million tons in 1990. Wastepaper-based liner will grow to about 55% of the market. European and Scandinavian capacity for kraft liner may grow a very little (almost an efficiency creep level) and there will be an increased need for imports from the U.S.

"Western Europe should continue to be our single largest market for kraft linerboard outside the U.S., despite tariff problems vis-à-vis the EFTA countries, exchange rate volatility and currency weakness, increasing transportation costs, and Scandinavian vertical integration into the EEC," Geist said.

Prospects will vary significantly by country, with strong currency areas such as West Germany providing good opportunities. Agricultural regions such as Italy, southern France, Spain, and Greece will also provide market growth due to several factors, including Scandinavian transport costs to the Mediterranean region. "But Europe, as a whole, will continue to be a very competitive market," the Weyco executive said.

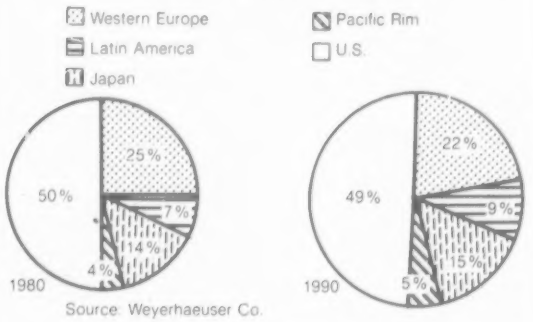
Japanese linerboard demand will grow from about 4 million tons in 1980 to about 5.5 million tons in 1990. "There has been little plastic substitution in Japan, and we don't expect to see much more substitution due to end uses of corrugated and the price of plastic feedstocks in Japan," Geist said.

More waste will be used in linerboard production in Japan, but availability and prices will be a constraint. The magnitude of that constraint will depend heavily on the yen/dollar exchange rate. "We see a reasonable range of imports of from 500,000 to 800,000 tons by 1990—given a 'reasonable' purchasing parity value for the yen in that time period."

Although hard to predict, future demand from the People's Republic of China should provide a growing market for U.S. producers, Geist said. Japan will play less of a role as an exporter to the Chinese market, wood resources in China are limited, and capital is not available for infrastructure and production facilities. At the same time, China's linerboard requirements should grow as the country increases export of light manufactured goods to earn needed foreign exchange.

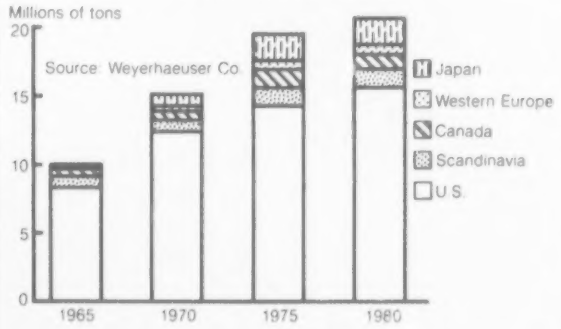
First significant U.S. linerboard exports to the PRC took place in 1980 when U.S. producers shipped 319,000 tons followed by another 174,000 tons in 1981. Only a small quantity of linerboard was shipped to China in the first quarter of 1982, but the Chinese have recently renewed some purchasing, and U.S. shipments this year could total more than 100,000 tons, Geist said later in response to a question.

Figure 3. **Changing regional share of linerboard demand for selected markets**



Source: Weyerhaeuser Co.

Figure 4. **Kraft linerboard capacity growth in major producing countries**



Limited export growth seen in white papers

Market pulp, linerboard, newsprint and wastepaper will continue to be the dominant U.S. export grades in the 1980s, with bleached board also increasing in importance, according to **J. W. Garrigan**, chairman of Price & Pierce International Inc.

While there has also been speculation about the U.S. becoming a major supplier of commodity grades to Europe, and some small quantities have been exported, no evidence of a definite trend exists, he said.

"Basically for the next few years, Europe has enough papermaking capacity to satisfy its own needs. Further, if the EEC needs to import more paper, then the Scandinavians, because of their freight and tariff advantages, are the logical suppliers."

If enough older, less-efficient capacity is phased out in Europe over the longer run, the U.S. may become a more important supplier to Western Europe because of its low wood and manufacturing costs. But while more U.S. paper may be shipped to Europe during the late 1980s, growth will be modest because of higher profitability in the U.S. home market and protectionist moves by the European industry.

Garrigan was also cautious about newsprint export growth, which would provide a much needed safety valve for excess North American capacity.

Worldwide, several million tons of new capacity will be brought on stream between 1980-84, an amount that will exceed demand by a considerable margin, making "some indigestion inevitable."

The large U.S. market will absorb the output from the new U.S. newsprint machines, but some Canadian tonnage will be displaced, forcing Canadian mills to try to place more tonnage in offshore markets. "Exactly where is difficult to pinpoint at the moment," Garrigan said. "Consequently, the outlook for the Canadian industry is not bright, particularly for the next two to three years."

However, the long-run outlook for wastepaper exports

from the U.S. is bright, according to Garrigan. From 1970 to 1980, wastepaper exports grew at an average annual rate of 21% and hit 2.4 million metric tons in 1980. Because of the worldwide recession, exports fell in 1981 and will probably fall more this year.

"When the world economy revives again forecast supplies of market pulp would seem to be insufficient to satifsy demand," he said. "As a result, the need for wastepaper should strengthen significantly."

But overall growth in U.S. paper industry exports to the Far East may not be as rapid as many expect, Garrigan said.

Although China is trying hard to modernize, "progress is proving to be much slower than was originally contemplated, and many projects have been scaled back or postponed indefinitely." And he noted that the export program for which China made its large containerboard purchases "may not have been nearly as successful as was planned."

While the Japanese may import more linerboard and newsprint in the 1980s because of high domestic production costs, growth in U.S. exports may be slower than many expect due to "the Japanese business system and nationalistic feelings."

Chip export market should remain stable

The sometimes volatile chip export market should remain fairly stable through the remainder of this year, according to **Lee C. Simpson**, vice president for operations, Louisiana-Pacific Corp.

"Lumber and plywood production on the West Coast is operating at 66% and 59% of capacity, respectively, and will probably continue at these rates through 1982." However, he noted that "pulp and paper manufacturers will probably take more downtime this year for inventory reduction than has been taken for the last ten years." And Japan, by far the largest buyer of West Coast chips, has contracted to buy fewer chips in 1982 than last year.

As a result, export contract chip prices, which were stable the first and second quarters (at around $101 to $103/bdu), will probably stay that way through the third and fourth quarters. But, spot prices on export chips, have been moving at a 30% discount to contract prices.

Export chip inventories have remained stable over the last four months at around 310,000 units, compared to a more normal level of 500,000 units. There has been some dislocation, however, with some inventory rise in Vancouver, B.C., and some decline at Coos Bay, Ore.

Simpson sees a fairly typical economic recovery, with housing improving in the second quarter of 1983 before much pickup in pulp and paper operations. As a result, chip inventories should begin to increase by the second quarter of 1983 or earlier, and prices may weaken.

Chips, shavings, and hog fuel have become an important part of the profitability of Northwest sawmills and plywood plants, the L-P executive noted. This importance has increased in the recent downturn, with operators chipping low-grade wood, enabling them to reduce the loss on their lumber output and generating an immediate sale. Revenue from these products often constitutes 5% to 8% of the total sales of the mill. □

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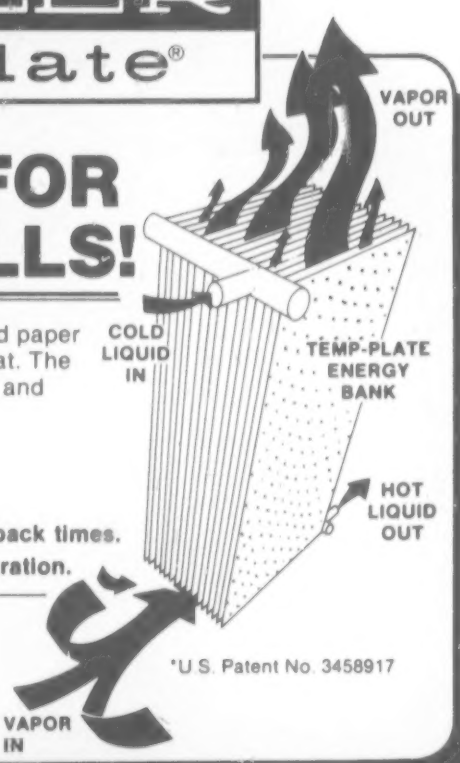

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Chlorate production steady, U.S. imports increasing

By BARRY SHOCKETT

U.S. sodium chlorate ($NaClO_3$) production has been flat since 1979 due to a slow economy and increased imports from Canada. Lower power costs in Canada (for example, Que.), where abundant hydropower has placed U.S. producers at a disadvantage, was one reason IMC closed its facility in Orrington, Maine.

Canadian producers face better prospects due to stronger export markets, although domestic demand is slow. Exports have grown from 14% of production in 1979 to an estimated 28% in 1982.

U.S. statistics, sodium chlorate (000 short tons)

	1979	1980	1981	1982e
Nameplate capacity	408	388	388	400
Production	268.6	278.4	280.5	280
Shipments	255.1	266.1	270	270
Imports	36.6	56.7	75.5	84
Exports	4.1	1.3	0.6	0.5
Apparent consumption	287.5	321.5	345	353.5
Pulp bleaching	236	263.5	283	290
Miscellaneous*	51.5	58	62	63.5

*Includes other chlorates, uranium, agriculture, and others
Source: Bureau of Census, U.S. Dept. of Commerce

Canadian statistics, sodium chlorate (000 short tons)

	1979	1980	1981	1982e
Nameplate capacity	270	314	346	404
Production	247	269.5	281	298
Imports	2.6	1.2	1.4	1.1
Exports	36.6	56.7	75.5	84
Domestic demand	206.5	219	207	215
Pulp bleaching	199	209.5	197	203
Other*	7.5	9.5	10	12

*Including uranium, agchems, and others

SODIUM CHLORATE

UNITED STATES

Uses: Pulp mills use most of the sodium chlorate for on-site generation of chlorine dioxide. Others uses are: chemical intermediate, uranium production, and agriculture.

Demand: Since 1979, ClO_2 generation has consumed about 82% of total ($NaClO_3$) demand. In 1981, pulp mills used an estimated 283,000 tons out of a total of 345,000 tons and this will increase to about 290,000 tons in 1982. 75,000 tons were imported in 1981, and this should increase to 84,000 in 1982.

Sources: The major chlorate producers include Erco Industries, Georgia-Pacific, Kerr-McGee, Occidental Chemical's Hooker Div., Olin, and Penwalt. Smaller facilities are operated by Brunswick Chemical, Huron Chemicals, and Pacific Engineering. In addition, imports from Canada are playing an increasing role in the U.S. market place.

Availability: Imports and increasing domestic capacity will keep an adequate supply in the foreseeable future. 1981, market; 1980, market; 1979, market.

Pricing: On Jan. 1, 1982, there were two list prices in effect: $420/ton and $440/ton, f.o.b. works. However, in the first six months the actual transaction price was down to around $375/ton, which had been the list price in early 1981 in the Northeast. Most producers eliminated the $45/ton discounting off the $420/ton list on July 1, 1982. Producers quoting the $440/ton list are reportedly matching the lower price. Prices should remain unchanged this year, but the $420/ton price could increase 8%-10% in 1983 to pass on increased power costs. History: 1981, $375/ton; 1980, $345-375/ton; 1979, $335-$345/ton.

Forecast: Additional capacity to be installed by mid-1983 may partially offset growing imports from Canada, but Canadian capacity should be nudging the 500,000-tpy mark by mid-decade. Postponement of the effective date for effluent regulations may somewhat retard growth in chlorine dioxide use.

CANADA

Uses: Most ($NaClO_3$) produced, either captively or for merchant sales, is employed by kraft pulp mills for on-site generation of chlorine dioxide used in pulp bleaching. Others include: uranium processing and agchems.

Demand: Pulp mills used an estimated 197,000 tons in 1981 (95% of the total), a 6% decrease from 1980 due to strikes on the West Coast and weak market-pulp demand. This should increase to about 203,000 tons in 1982, but weak pulp markets will keep slowing growth.

Sources: Major merchant producers are: Canadian Occidental, Erco Industries, Kema Nobel (formerly QueNord Chemicals), and PPG Industries' Stanchem Div. BCM Technologies will bring its first plant online by 1983 with production dedicated to export markets. Four small captive plants have closed since 1979 (most recently Canso Chemicals) leaving BC Chemicals, St. Anne Chemical, and Saskatoon Chemical as captive producers.

Pricing: Prices increased from $410/ton to $420/ton, f.o.b., works in early 1982, up from the 1981 price of $365/ton, and should stay unchanged through the rest of the year. History: 1980, $310-$330/ton; 1979, $281-$310/ton.

Availability: $NaClO_3$ supplies will be adequate with 57,000 tons of capacity starting up in 1982 and 58,000 additional tons in 1983. 1981, market; 1980, market; 1979, market.

Forecast: Demand growth for $NaClO_3$ has slowed, but a number of new ClO_2 generators are planned and demand should grow 6%/year when these markets revive.

Mr. Shockett is consulting editor-chemical markets for PULP & PAPER.

September 1982

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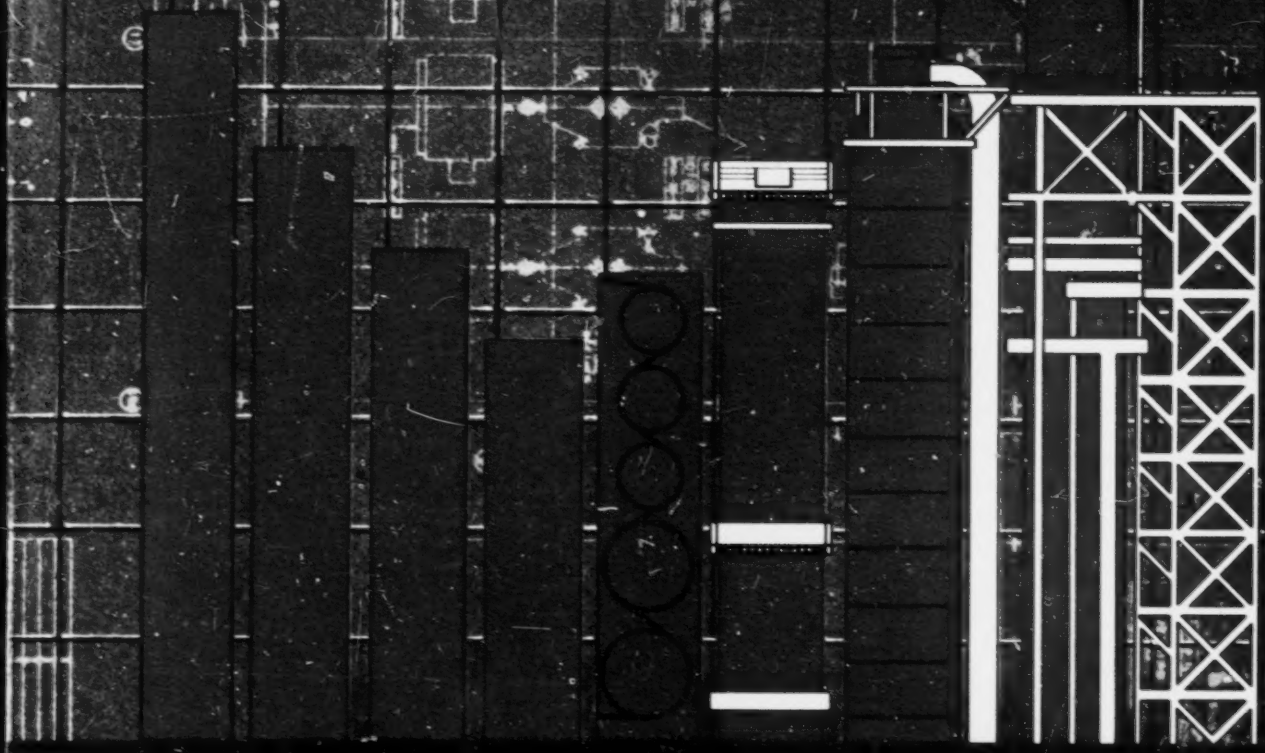

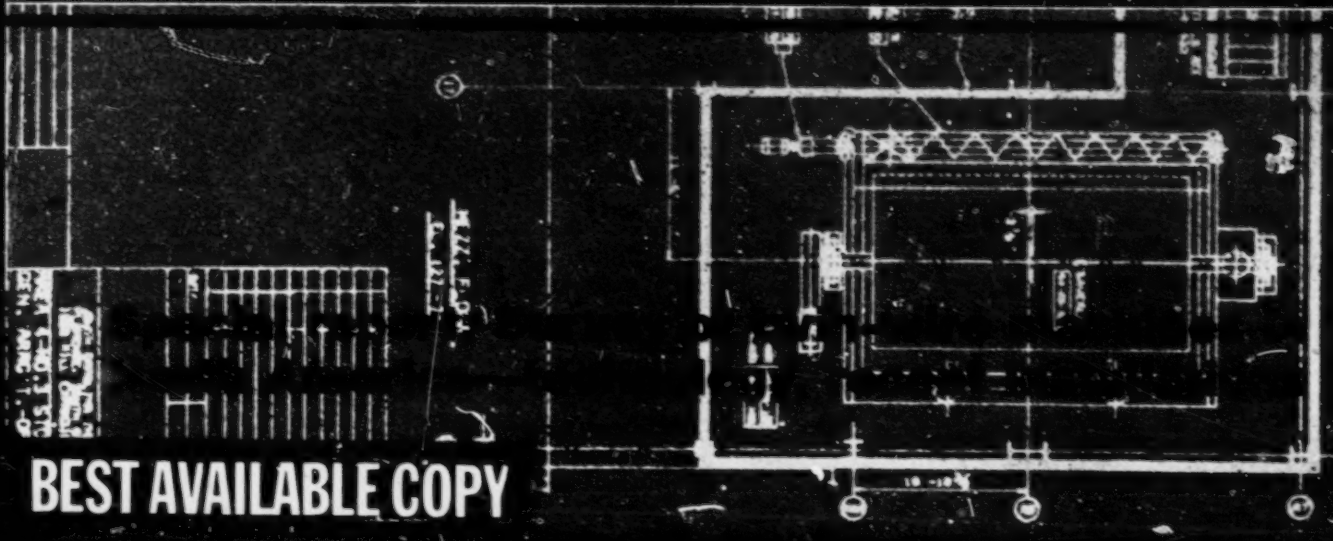

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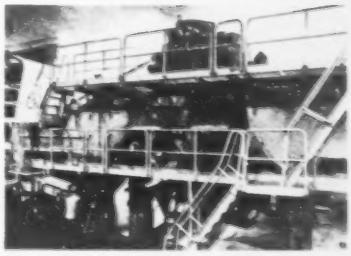

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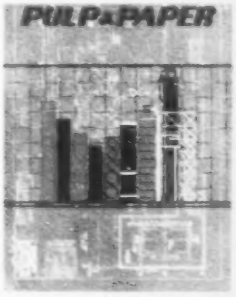

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ABP

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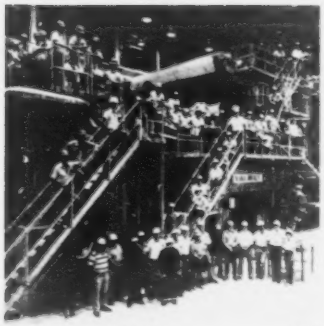
BPA



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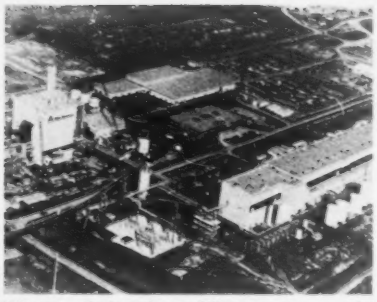

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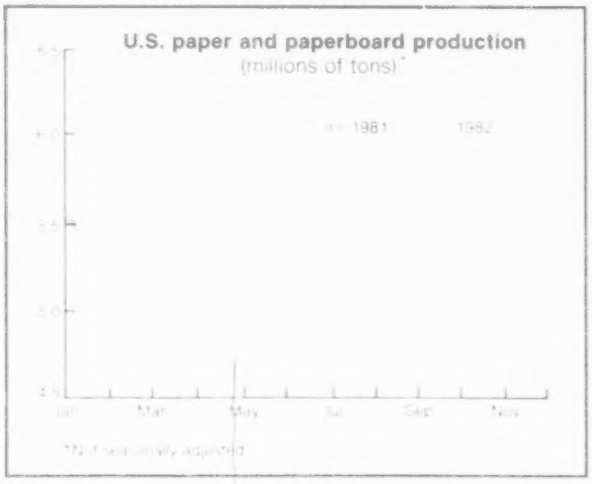
MONTH IN STATISTICS

U.S. paper and paperboard production in June totaled 4.9 million short tons, 7.3% below June 1981 levels, according to the American Paper Institute. Adjusted for seasonal and workday factors, the June production rate came to 59.4 million tpy, bringing the second-quarter average to 57.8 million tpy, down from the first-quarter average of 61.0 million tpy.

Among major grades, newsprint continued to exceed its year-ago level for the first six months of the year, while coated paper showed the strongest trend among printing paper grades, with six-month shipments nearly matching year ago. In contrast, packaging and industrial paper grades were down sharply for the six-month period, down 9% from 1981 levels. Declines in paperboard production were fairly well distributed throughout the grade structure, with the largest decline for the first half in semichemical medium, down 9%.

Total Canadian newsprint shipments in June came to 418,000 metric tons, down 18.8% from June 1981, according to the Canadian Pulp & Paper Assn. Newsprint mill operating rates slipped to 79% in June from 88% in May, and were well below the 96% rate of a year earlier.



	Latest month (000 short tons)		% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	June	423	−4.9	5,240	2.0
Uncoated groundwood (s)	June	114	5.8	1,398	−6.2
Coated paper (s)	June	415	1.2	4,922	−0.5
Uncoated free sheet (s)	June	609*	−8.6	7,803	−4.2
Unbleached kraft packaging and industrial (s)	June	292	7.6	3,656	−9.3
Tissue	June	355	6.1	4,395	3.1
Total paper	**June**	**2,147**	**−6.0**	**30,423**	**−3.5**
Kraft linerboard, unbleached	June	1,127	−8.1	13,927	−7.9
Semichemical medium	June	376	−3.1	4,489	9.0
Bleached paperboard	June	310	6.3	3,801	−6.5
Recycled paperboard	June	540	11.2	6,773	−7.8
Total paperboard	**June**	**2,430**	**−8.4**	**30,073**	**−7.8**
Total paper and paperboard*	**June**	**4,876**	**−7.3**	**60,495**	**−5.7**
PULP, WASTEPAPER & FIBER[2]					
Total woodpulp production	May	4,266	7.3	51,205	−4.3
Market pulp production	May	480	10.6	5,934	−4.7
Wastepaper consumption at paper/board mills	May	1,195	−7.2	13,935	−3.6
Pulpwood consumption (cords)	June	6,300	−6.2	79,234	−2.0
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	June	20.071	5.1	117.590†	−6.3
Containerboard inventories at box plants	June 1	2,663	15.8		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	May	746	−0.9	8,027	−6.7
Imports of Canadian newsprint	May	618	–	6,782†	5.2
U.S. paper exports (including products)	May	380	−15.2	4,232	−16.1
Exports of unbleached kraft linerboard	June	167	4.4	1,951	−4.3
Exports of woodpulp	May	326	−10.2	3,565	−5.9
CANADIAN STATISTICS[4] (reported in metric tons)					
Total newsprint shipments	June	418	−18.8	2,885†	−6.0
Operating rates	June	79%	96%	89%	97%
Inventories held by U.S. consumers	June 30	1,564	12.1		
Woodpulp shipments (export only)	June	507	−25.7	2,978†	−18.7
Operating rates	June	83%	96%	83%	92%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. Canadian Pulp & Paper Assn
*Includes construction and wet machine grades. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments

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FINANCE

U.S. paper profits fall in second quarter

Continued depressed market conditions in North America and abroad caused U.S. pulp and paper industry second-quarter profits to drop sharply from a year ago, with at least four major companies reporting losses for the period. Paper profits fell 41% on a 10% drop in sales, according to reports from 28 firms.

The earnings decline reflected lower shipments along with a serious profit margin squeeze caused by substantial price erosion—with such grades as containerboard, market pulp and much uncoated white paper selling below year-ago levels.

For seven more firms with extensive forest products holdings, the second quarter was even bleaker: earnings fell 54% and sales were off 8%, as high interest rates continued to curtail housing starts and wood products operations generally ran in the red. Earnings for the total U.S. paper/forest products industry dropped 45%, while sales were 9% below 1981.

IP profits tumble. "The poor performance of the U.S. economy, weak export markets, and continuing high interest rates combined to depress demand and prices for lumber, plywood and paper products," said Edwin A. Gee, International Paper Co. chairman and CEO. IP reported earnings down 51% —to $41.2 million on sales of $1.03 billion—a decline of 26% from year-earlier levels.

Crown Zellerbach posted a 43% profit decline on an 8% falloff in sales, with a sharp improvement in earnings from domestic operations offset by substantial losses from the company's Canadian subsidiary. Great Northern Nekoosa Corp.'s earnings fell 29% on a 7% drop in sales, due to an almost 13% decline in shipments of paper, containerboard and pulp coupled with "widespread" price weakness. Mead Corp. posted a $1-million loss for the quarter vs profits of $36 million in second-quarter 1981, and a 7% decline in sales.

Wood products still down. A slight seasonal pickup in second-quarter demand was not enough to pull wood products operations out of the red for most major forest products companies, while income from their pulp and paper operations continued to erode. Boise Cascade Corp. reported an $8-million loss in the quarter vs profits of $27 million a year ago, citing not only poor business conditions but also rapidly deteriorating market conditions for paper products. Georgia-Pacific Corp. posted a 29.1% increase in second-quarter earnings to $71 million, but this included substantial income from the sale of tax benefits and a natural gas royalty interest.

Canadian profits plummet. Continued weak pulp and paper demand combined with the depressed building materials market caused earnings of Canadian pulp and paper companies to deteriorate further in the second quarter, with most western companies posting losses, according to reports from ten producers. The 11 firms reported earnings down an aggregate 89%, while sales fell 15%—and this was despite a substantial benefit from favorable exchange rates.

Losses for the quarter were sustained by six companies, while all but one of the remaining five reported substantial earnings declines. Weak demand for pulp and newsprint, flat or eroding prices, and rising costs were blamed for the poor performance. Western firms, in particular, were also hurt by the depressed wood products market and heavy debt charges.

U.S. PAPER/FOREST PRODUCTS RESULTS

Second quarter ($000)

Paper companies	Sales	Change 1982/81	Earnings[1]	Change 1982/81
Champion	$56,652	18.7%	$1,763	75.3%
Cleveland	29,200	3.6	1,259	0.7
Consolidated	132,797	1.9	10,874	19.1
Crown Zellerbach	750,400	7.8	11,900	42.8
Diamond	237,334	12.9	4,420	45.0
Federal Paper	114,701	3.6	4,923	44.6
Fort Howard	136,796	17.5	22,385	12.4
Gilbreth	69,454	14.2	4,773	12.6
Great Northern Nekoosa	668,200	7.2	76,200	29.2
Hammermill	172,569	0.6	10,535	23.1
Int. Paper	1,030,000	25.7	41,200	51.5
Longview Fibre				
(4-30)[2]	207,088	1.1	6,708	19.4
Kimberly-Clark	774,100	3.0	58,500	5.7
Louisiana (4-30)[2]	96,058	2.7	5,423	9.6
Mead	703,716	6.9	(998)	n.m.
Mosinee	20,078	15.3	994	39.6
Penntech	21,964	36.5	3,261	84.2
Potlatch	64,800	31.7	(165)	n.m.
St. Regis	651,605	9.6	17,106	47.1
Scott	567,839	3.2	29,253	7.7
Sonoco	137,553	2.3	7,742	35.5
Temple	104,614	12.3	(166)	n.m.
Union Camp	140,533	14.3	(5,553)	n.m.
Valley Container	104,369	1.4	2,307	69.5
Union Camp	383,511	12.4	33,722	31.1
Weyerhaeuser (3-31)[2]	46,236	12.5	505	66.4
Westvaco	376,868	4.3	17,007	32.1
Willamette	234,173	10.8	(816)	n.m.
Total	**7,831,906**	**−9.5**	**308,506**	**−40.9**
Forest Products				
Boise Cascade	740,910	8.9	(8,440)	n.m.
Champion Int.	960,055	10.8	11,524	74.9
Georgia-Pacific	1,470,000	1.4	71,000	29.1
Louisiana-Pacific	226,050	23.5	(4,260)	n.m.
Pope & Talbot	70,800	10.2	962	63.5
Potlatch	205,666	9.2	8,126	35.9
Weyerhaeuser	1,091,141	2.7	26,143	65.1
Total	**4,705,203**	**−7.5**	**105,055**	**−53.5**
U.S. total	**12,537,109**	**−8.8**	**413,561**	**−44.7**

CANADIAN PAPER INDUSTRY RESULTS

Abitibi	C$416,246	10.7	C$(5,390)	n.m.
B.C. Forest	210,600	15.1	(32,310)	n.m.
Can. Pacific	371,900	1.7	17,500	38.4
E.B. Eddy	171,400	11.9	(6,400)	n.m.
Domtar	424,900	11.5	2,700	77.5
Fraser	99,400	3.6	(1,186)	n.m.
Great Lakes	309,164	29.9	6,427	14.3
Mac. Bloedel	466,800	14.1	(11,100)	n.m.
Rolland	40,800	12.4	(773)	n.m.
Scott	93,600	0.8	4,200	2.4
Weldwood	105,040	28.4	(3,170)	n.m.
Total	**2,519,859**	**−15.2**	**18,181**	**−88.6**

1. Income after taxes from continuing operations excluding extraordinary items in both years.
2. 1981 figures restated by company.
3. 1981 figure excludes sales of $258 million from Canadian paper mills Great Lakes Paper Co. which was sold in the fourth quarter of 1981.
4. Latest period. Figures for latest three are for fourth quarter. Westvaco for third quarter.

n.m. = not meaningful

Agri-Timber merges Interstate units

Agri-Timber Inc., a holding company owned by William F. Belote of Dublin, Ga., announced that it has merged its forest products interests into a new company, Interstate Resources Inc., to be based in Cincinnati, Ohio. Assets involved include Interstate Container Corp.'s 550-tpd linerboard mill at Riceboro, Ga., Interstate Container Corp.'s 100-tpd recycled corrugating medium mill at Reading, Pa., and three box plants, as well as Newport Timber Corp., a biomass fuel supply firm.

The new company is owned jointly by Belote and Georges N. Frem, chairman of Indevco, an international industrial development company based in Lebanon with interests in packaging, consumer products, housing, and hotels. The value of the transaction was not disclosed.

Last year Belote, through Agri-Timber, acquired all the stock of the three operating companies in the merger (P&P, July 1981, p. 21). Belote owns or controls over 200,000 acres of timberland in Georgia, Florida and South Carolina, sawmills and plywood plants in those states, and timberland in Central America.

Major coated groundwood (No. 4 and No. 5) capacity expansions—the end of a binge

Announced or completed	Location	Annual short tons	Startup date
Consolidated*	Whiting, Wis.	95,000 (net)	1979
Kruger	Trois Rivieres, Que.	70,000	1979
GN Nekoosa	Millinocket, Maine	45,000	1980
Midtec*	Kimberly, Wis.	125,000	1980
International Paper*	Jay, Maine	112,000	1980
Crown Zellerbach	West Linn, Ore.	65,000	1980
	St. Francisville, La.	12,000	1980
Fraser	Madawaska, Maine	80,000	1980
Boise Cascade*	Rumford, Maine	160,000	1981
Nitec	Niagara Falls, N.Y.	70,000	1981
Consolidated	Wisconsin Rapids, Wis.	13,500	1981
Mead*	Escanaba, Mich.	200,000	1982
St. Regis*	Sartell, Minn.	170,000	1982
Weyerhaeuser*	Columbus, Miss.	175,000	1982
Pentair	Niagara, Wis.	30,000	1983-84
Proposed			
Blandin*	Grand Rapids, Minn.	175,000	n.a.
Weyerhaeuser*	Columbus, Miss.	n.a.	n.a.

*New machines. Source: *P&P Project Report*

EXPANSION

Weyco starts up Columbus machine

Weyerhaeuser Co. has started up the 175,000-tpy coated groundwood paper machine at its new Columbus, Miss., mill, the company confirmed. The 500-tpd, 289-in.-trim Beloit fourdrinier will be supplied with pulp from a 260-tpd Bauer thermomechanical pulp mill, along with a similar amount of bleached kraft pulp from the company's New Bern, N.C., mill.

An off-machine trailing-blade coater will be used with two supercalenders to produce a sheet in the 40- to 45-lb basis weight range. The mill also has a hog fuel boiler and two turbines with combined 30- to 35-Mw capacity.

This represents Weyco's first effort to produce coated groundwood. The new mill may eventually have as many as three machines, with the second being an uncoated free-sheet unit and the third producing coated groundwood. The second and third machines have been postponed indefinitely due to economic conditions (P&P, Apr., p. 27).

Aerial view of Weyco's new Columbus, Miss., TMP/LWC paper mill.

St. Regis LWC machine on-line

Uncoated paper was successfully being run through a new 480-tpd lightweight coated paper machine that was started up on July 1 at St. Regis Paper Co.'s Sartell, Minn., mill, and salable uncoated paper was expected to be produced by the new No. 3 paper machine soon after. Coated paper production was not expected to begin until this fall.

The new 320-in.-trim, 3500-fpm Beloit fourdrinier has two on-machine coaters. It is intended to produce 34-lb LWC. A new 400-tpd thermomechanical pulp mill, which also came on-line in early July, will supply pulp to the new machine and eventually also supply the two other paper machines at the mill, which make 280 tpd uncoated paper.

The $250-million project, begun in May 1980, included $200 million for the paper machine and a power boiler, effluent treatment system, paper warehouse, water filtration system, supercalenders, winders, and roll-grinding building. The $50-million TMP mill added a woodroom.

Portals starts up Georgia mill

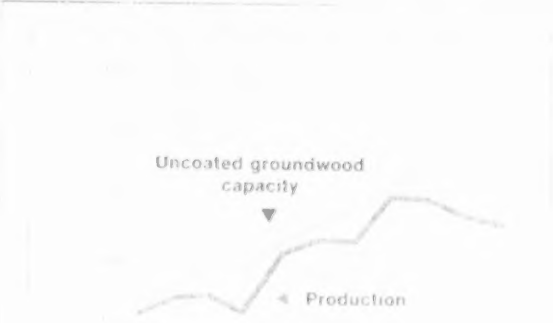
Portals Inc.'s $15-million, 2500-tpy security papers mill at Hawkinsville, Ga., started up in July, according to company president David Mason. The mill marks the entry of parent company Portals Ltd. of the U.K. into the North American market (P&P, Nov. 1980, p. 13).

The Hawkinsville mill will produce both currency paper for worldwide export and security paper to be used by the travelers check industry for U.S. markets, Mason said. The mill's single cylinder-mold machine is a composite make from several western European manufacturers, and will utilize cotton pulp from southeastern U.S. mills and woodpulp from Canada. Further equipment details were unavailable.

Uncoated groundwood paper: Weak economy, pressure from other grades hurt demand

Statistics:	1980	1981	1982e
Production, 000 tons	1498	1441	1412
Capacity, 000 tons	1624	1658	1774
Utilization rate, %	92.2	86.9	79.6
Imports, 000 tons	688	650	610
Exports, 000 tons	101	120	138
Apparent U.S. consumption			
000 tons	2085	1971	1884
lb/capita	18.73	17.54	16.59
000 tons/$billion real GNP (1972)	1.41	1.31	1.26

*All tons are short tons
e = estimated



Grade structure: Uncoated groundwood papers are similar to newsprint in terms of physical properties, and the two grades constitute the major low-cost printing papers. Brightness is higher for uncoated groundwood—typically 64 to 70 Elrepho for uncoated groundwood, compared with 56 to 62 for newsprint. Endurance and printing characteristics are better than for newsprint, but not on a par with coated groundwood paper. Typical end-uses include catalogs, directories, periodicals, advertising circulars, and business papers, such as computer printout. Basis weights range from 20 lb to 45 lb/3300 ft².

Production/capacity: Production of uncoated groundwood papers has fallen since 1979, and American Paper Institute figures show output dropped another 5.4% in the first five months of 1982 to an annual rate of 1.40 million short tons. Capacity rose by 7.0% between 1981 and 1982 with the 1981 startup of a new 165,000-tpy machine at Madison Paper's Madison, Maine, mill, but is then expected to remain virtually flat at least through 1984, rising to only 1.784 million tpy in that year.

Canadian Pulp & Paper Assn. figures place Canadian capacity at 865,000 short tpy in 1982, but P&P estimates true Canadian capacity to be far higher, since Canadian companies traditionally underreport to avoid tariffs on paper shipped to the U.S. A more accurate estimate would be 1.96 million tpy in 1982, rising to nearly 2.1 million tpy by the end of 1983.

In addition to the questionable nature of official Canadian statistics, the gathering of reliable capacity estimates is also complicated by the ability of some mills to swing between uncoated groundwood, newsprint, and coated groundwood, depending on fiber mix and use/nonuse of coaters. However, P&P believes its company capacity list represents a reliable picture of capacity normally dedicated to this grade.

Outlook: Uncoated groundwood mills have fallen victim to two problems since 1979: stagnation in the U.S. economy has slowed growth of many major end-uses, and a rapid jump in capacity of newsprint and coated groundwood papers has put price pressure on uncoated groundwood from above and below. Consumption will end 1982 at about 15.7% below 1979 levels, with loss of market share on the part of uncoated groundwood showing up in nearly every end-use category. Any pickup in demand will probably have to await a recovery in consumption of Sunday newspaper supplement, catalog, directory, and computer-printout, not likely to occur before late 1982 at the earliest.

Estimated capacities of major companies are:

	Annual capacity (000 tons)			Capacity N. American market
	U.S.	Canada	Total	%
1. Abitibi-Price Inc.		425	425	11.4
2. Great Northern Nekoosa	402		402	10.8
3. CIP Inc.		380	380	10.2
4. Consolidated-Bathurst Ltd.		352	352	9.4
5. MacMillan Bloedel Ltd.		347	347	9.3
6. Boise Cascade Corp.	40	260	300	8.0
7. St. Regis Paper Co.	225		225	6.0
8. Domtar Inc.		163	163	4.4
9. Cascades Inc.	135		135	3.6
10. Madison Paper	130		130	3.5
11. Crown Zellerbach	130		130	3.5
12. Kimberly-Clark Corp.	93	28	121	3.2
13. Howard Inc.	70		70	1.9
14. Fraser Co. Paper	57		57	1.5
15. Wiggins Paper Mills	30		30	0.8
Tolaram, Oxford Corp.				
Domtar Paper Co.				

North American capacity (1982): 3.729 million tons (U.S.: 1,774; Canada: 1,955)
Capacity share of top five companies: 51.1%
Capacity share of top ten companies: 76.7%

Pricing: Mills had some success at passing along price increases during late 1981 and early 1982 despite soft demand—directory paper prices, for example, rose by 12%, to 12.4%, although rotonews prices moved up only 3%. Prices for 25-lb roto catalog are ($/short ton): 1974, 320; 1975, 320; 1976, 345; 1977, 405; 1978, 425; 1979, 468; 1980, 495; 1981, 551; 1982, 551. Typical prices for 30-lb standard rotonews printing paper: 1978, 345; 1979, 386; 1980, 427; 1981, 490; 1982, 505.

BEST AVAILABLE COPY

Energy-efficient design efforts are paying off for paper industry

Modernization, upgrade projects during the past ten years have focused on more efficient use of energy, byproduct fuels, process steam, and equipment

By JAMES M. TUCKER JR.

☐ The past decade has been a critical period for the pulp and paper industry as environmental restrictions and rapidly escalating energy costs have placed substantial strains on its fiscal health. However, the paper industry has utilized energy better and achieved greater efficiency from available energy sources than most, if not all, of the major industries. More than 95% of all large pulp and paper facilities in the U.S. now have in-plant power generation. The industry's ability and willingness to devote effort to further increase the use of available in-plant energy sources and enhance purchased energy use has enabled it to reduce energy problems to manageable size and remain competitive in the world market.

This article discusses specific energy-related gains made by the paper industry during this critical period and examines, mainly from a design viewpoint, those areas of the process where major improvements have been made. Particular attention is given to power and recovery, the pulp mill, and process control, since these areas are most often targeted in upgrade/modernization projects designed to improve overall energy efficiency.

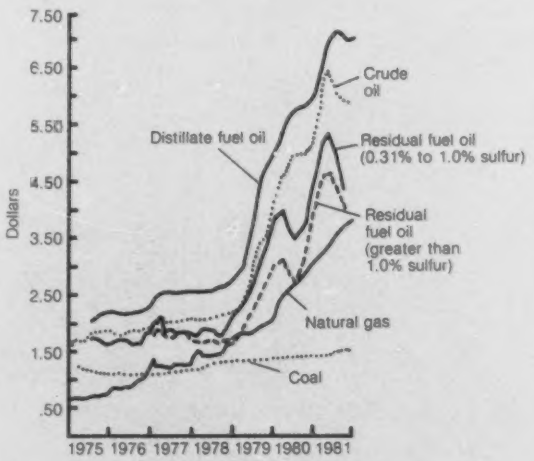
Maintaining economic balance

The magnitude of the energy problem is illustrated in Figure 1, which presents a comparison by the American Paper Institute (API) of selected fuel costs for the past seven years (1975-1981). These trends represent average national costs in general industry and are not limited to the pulp and paper industry. As can be seen, the cost of fuel oil has increased approximately 250% since 1979.

The pulp and paper industry has reacted to soaring energy costs in a very positive way. Figure 2, prepared by API, shows the cost of purchased fuels and electric energy as a percentage of the total value of shipments by pulp, paper, and paperboard mills for the past ten years (1972-1982). Rising energy costs have increasingly become one of the major components of operating cost, but the potential impact on profitability has been substantially reduced by improved energy utilization and efficiency.

In Figure 3, changes in energy use and paper industry production for the same ten-year period are compared with other selected industries. The comparison is very favorable for the paper industry. Figure 4 presents the average use (in Btus) of fossil fuels and purchased energy/ton of product for the 1972-1981 period based on reports from 92% of the pulp and paper industry. The reported 24.8% reduction in purchased energy use/ton of output is increased to 30.4% when the net effect of changes in capacity utilization, environmental energy use, and fuel mix are taken into account.

Figure 1. **Comparison of selected fuel costs (million Btus)**



Sources: American Paper Institute; Dept. of Energy, EIA Month Energy Review; Dept. of Labor, Bureau of Labor Statistics

Mr. Tucker is vice-president of engineering, Simons-Eastern Co., Atlanta, Ga.

The quarterly data reported for 1981 and presented in Figure 5 indicate that the downward trend in energy use/ton is being maintained despite the slowdown in capacity utilization. It should also be noted that self-generated and residue sources of energy accounted for 50.1% of the industry's total energy consumption during 1981, compared with 40.5% in 1972. Use of fuel oils by the paper industry decreased by 40.4% for this same period. Figure 6 presents API data on use of self-generated energy for three years: 1972, 1980, and 1981.

Current status of energy utilization

To achieve the pulp and paper industry performance briefly outlined above, substantial contributions had to be provided through utilization of byproduct fuels. The chemical recovery boiler in a kraft pulp mill usually provides more than 50% of the mill's requirements for process steam from the combustion of organic matter in spent cooking liquor. Bark and woodwaste from woodyard operations are additional sources of in-plant fuel.

These inherent, inexpensive fuel sources and the isolated location of many mills have historically resulted in substantial in-plant steam and power generation by pulp mills. However, management's continued demand for product and process improvements resulted in a long-term trend toward increased power consumption with, in many instances, an attendant reduction in process steam usage. Contributing to this process steam/electric power imbalance were:

- Improvements in manufacturing processes and equipment design which provided more efficient steam usage
- Increased use of higher pressure steam in the manufacturing processes
- Increased use of electric motor drives for process equipment
- Increasingly stringent requirements for pollution control.

At the same time, process improvements, such as increased pulp yield and better utilization of all fiber sources, have reduced the quantity of byproduct fuels available.

Principles and accomplishments

The underlying principles or objectives on which all energy-saving accomplishments have been based are:

- Make better use of existing plants by reducing energy losses
- Make existing manufacturing processes and equipment more efficient by reducing energy needs
- Develop and apply more energy-efficient technology to process and equipment design.

To date, the industry's achievements are primarily the result of significant progress by numerous mills in the first two areas. Work on development and application of new technology is also yielding dividends, although its impact on the industry at this stage is still minimal.

Energy conservation efforts have been rewarding and have covered every energy-consuming process in the mill from woodyard to pulp dryer. Process and equipment improvements have also yielded substantial dividends, particularly for new plants where improvements in evaporator and boiler design have permitted increases in boiler capacity as well as design pressure and temperature.

A major factor in achieving improved power-plant performance has been the changing nature of steam and power demands for pulp manufacture. The historic "swings," or load fluctuations, of batch processes greatly limited the number of power cycles that could be utilized to economically satisfy a pulp mill's requirements for steam and electric power. The substantial reduction in amplitude and frequency of load variations, through application of continuous processes and improved controls, has greatly expanded the options available to the designer of a pulp mill facility in the 1980s.

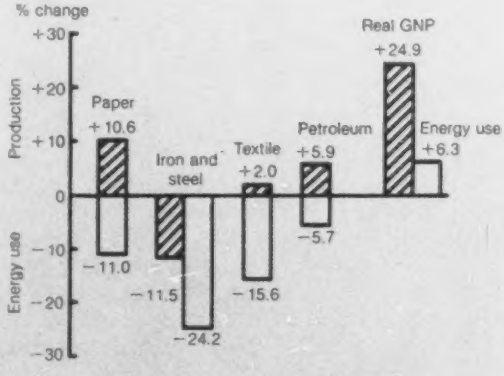
General savings

In a modern pulp mill, no piece of auxiliary equipment is more visible or more critical to operating success

Figure 2. **Cost of purchased fuel and electric energy as a percentage of value of shipments in the pulp and paper industry**

Sources: American Paper Institute (cost of purchased fuels and electric energy estimated by API for 1972, 1973, 1977, 1978, 1979, 1980, and 1981), Survey of Manufacturers, Bureau of the Census

Figure 3. **Changes in energy use and production for selected industries between 1972 and 1980**



Sources: American Paper Institute, American Iron & Steel Institute, American Paper Industry, American Petroleum Institute, American Textile Manufacturers Institute, U.S. Dept. of Commerce

than the pump. The pump is also frequently one of the greatest sources of energy waste because of oversizing. In an attempt to be conservative, the designer often selects pumps with excessive margins in both capacity and total head. The magnitude of possible energy savings from this seemingly mundane item can be placed in proper perspective by the results of a recent pump survey conducted at a 750-tpd pulp mill.

The mill had asked for bids on 250 pumps in 93 mill services. Data on pumps from four manufacturers were compared for each of the 93 services according to the specific requirements. In calculating potential differences in energy usage between the offerings, the survey treated the pumps available from each manufacturer as a group. The selected group provided an average improvement in efficiency of 5.6%. The difference appears small, but the resulting 531-hp reduction would provide an annual savings in energy costs of more than $130,000.

Impressive savings have also been achieved from the use of variable-speed drives on pumps to eliminate energy losses caused by throttling control valves. Successful variable-speed drive applications have been made for both new and existing installations.

A reduction in energy losses can also be obtained by improved insulation on hot vessels and piping where paybacks of one to two years have been obtained, and by improved recovery and reuse of low-grade heat generated in the pulp-manufacturing process.

However, the greatest gains have been achieved by designing new process systems to use less water and lower-pressure steam and to operate at a more uniform rate. These objectives have been attained by applying both old and new ideas and by using the improved control systems now available. The computer has been a major factor in these accomplishments. It has served well in analyzing processes, design of equipment and facilities, and control of operating systems.

Power cycle fundamentals

A "good" power balance for an industrial power cycle is achieved if power losses are minimized and power acquisition is based on a correct evaluation of energy costs and availability. Generally, the manufacture of pulp and paper uses processes that enhance the economics of in-plant generation of heat and mechanical power, since its processes require large quantities of heat obtainable from steam at low to moderate energy levels.

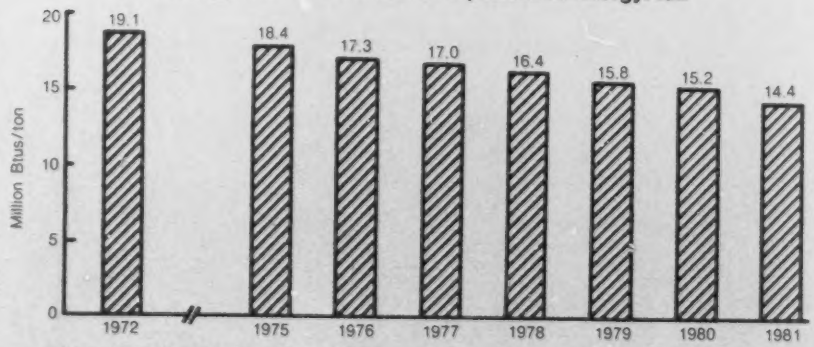
This feature provides the pulp mill owner with the opportunity to obtain inexpensive mechanical power to generate electricity by producing steam at high energy levels and extracting the resultant excess energy with steam turbines. In general, power plant designers have kept pace with the trend toward higher ratios of electric power to process steam usage by designing for higher initial steam conditions. This approach has permitted more by-product power to be generated from each pound of steam required by the manufacturing processes for heating purposes. Conditions limiting the electric power generated in this manner are those that limit the boiler superheater outlet conditions and steam turbine efficiency, such as:

- Boiler and turbine metallurgy are restricted for all practical purposes to a maximum steam temperature of 1000°F
- Operation of a chemical recovery boiler at pressures exceeding 1000 to 1250 psi involve additional safety hazards unless the unit is provided with special metallurgy or extraordinary maintenance to prevent fireside corrosion of furnace tubes
- Turbine efficiences become progressively lower as higher pressures are used
- A minimum flow of steam is required to maintain process steam control
- Established in-plant utilities may restrict the use of more favorable steam conditions for a plant expansion.

Recovery boiler

The modern recovery boiler is the result of repeated design modifications in response to operating difficulties, environmental constraints, operating hazards, and economic demands. Several units placed in operation during 1982 have been designed for operation at 1500 psi, and the largest unit will have a burning capacity of 200,000 lb/hour of black liquor solids. The capacity rating of a recovery boiler reflects its initial—and still critical—role as a part of the chemical recovery system. Critical to its satisfactory operation and use as a steam generator is a

Figure 4. **Pulp, paper, and paperboard industry's average use of fossil fuel and puchased energy/ton**



Source: American Paper Institute

constant supply of black liquor fuel properly concentrated for optimum firing. To achieve this goal, reduce the emission of pollutants to required levels, maintain personnel and equipment safety, and increase the generating pressure to a more economic level, the following features are now provided on recovery boilers:

- Black liquor fuel concentrated to approximately 65% to 67% solids and sprayed directly into the furnace cavity
- All welded furnace construction with the lower part of the furnace constructed of composite tubes to improve corrosion resistance
- An extended economizer with parallel gas passages
- A two-chamber, high-efficiency (99.65%) electrostatic precipitator of wet-bottom design with a stainless-steel liner to clean fluegases, and an energy-management system to automatically adjust power to maintain desired opacity
- Screen tubes and baffles in boiler bank eliminated and spacing increased on superheater elements to minimize plugging; furnace height and volume increased to improve oxidation of combustibles and reduce carryover to boiler bank
- Sootblower speed increased from 70 to 100 in./min
- More levels of vibration snubbers for boiler bank tubes
- Maintenance beams installed through the rear wall and nose baffle, or contained in nose cavity with telescoping-type beam
- Vertical buckstays provided on large units for furnace design pressure of about 26-in. water gauge
- High primary air to help control the shape of the smelt bed
- High-energy arc igniters used for auxiliary burners
- Hotter bed temperatures used to reduce TRS emissions with 400°F primary air supply
- Green liquor recirculation eliminated to improve reduction efficiency
- Variable-frequency a.c. drives for black liquor fuel pumps
- Atmospheric rapid-drain system for safe shutdown in case of tube rupture
- Forced-draft fan placed high in building to use hot air, which accumulates in upper levels
- Insulation increased to 6-in. thickness to decrease heat losses
- Computer control of combustion and liquor solids
- Chemical ash tank to get sluice from economizer hoppers and return to precipitation wet bottom or level tank
- Scrubber for dissolving tank(s) vent.

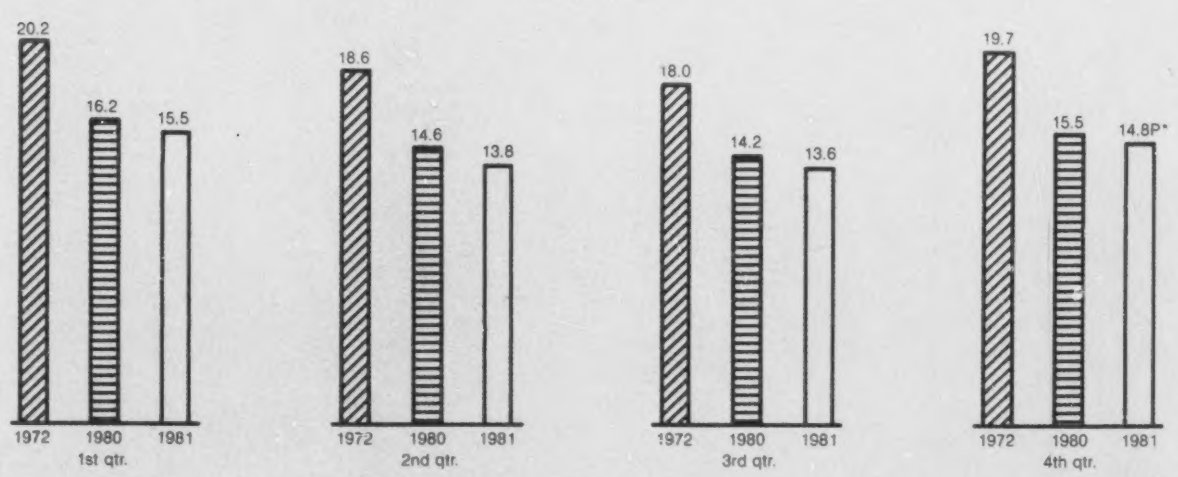
Power boiler

Required process steam in excess of that available from the recovery boiler is usually provided by a combination bark- and coal-, or bark- and oil-fired boiler. High oil prices and governmental regulations have almost eliminated the latter option.

The primary features of a modern bark- and coal-fired boiler are:

- Coal pulverized and injected through a coal burner directly into the furnace
- Bark and refuse hogged and fired using a spreader stoker and travelling grate
- More levels of overfire air and a higher percentage of overfire air to total air
- Live-bottom bins with metering screws for control of bark feed to boiler
- A fan or separate air supply for NO_x control
- Furnace volume heat release reduced to between 15,000 and 20,000 Btus/hour/ft^3
- Stoker heat release rate for woodwaste using alloy grates ranging from 1.0 to 1.25 million Btus/hour/ft^2
- SO_2 scrubbers, of either wet or dry design, to control SO_2 emissions (some of the designs have the capability of attaining desired performance with a pressure drop of less than 10 in. water gauge)
- Gravimetric coal feeders to improve combustion control
- A high-efficiency (99.5%) electrostatic precipitator for control of particulate emissions
- Reinjection of unburned char

Figure 5. **Fossil fuel and purchased energy use/ton actual average use**
(million Btus)



Source: American Paper Institute *P = preliminary

• Computer control and monitoring of combustion.

Black liquor evaporators

Concentration of used cooking liquor to a solids level that will provide efficient operation of the recovery boiler has traditionally been accomplished with a 5- to 6-effect evaporator set. The need to concentrate black liquor to 65% to 67% for direct firing in the recovery boiler has resulted in an additional stage or concentrator, generally installed in duplicate with switching valves to permit frequent cleaning.

Removal of water from kraft black liquor uses about 5.2 million Btus of energy/ton of pulp. Approximately 60% of this energy is used in the multieffect evaporator to remove about 90% of the water. The remainder is used in the recovery boiler at a 1:1 economy to remove the final 10% of the water. Increasing the liquor solids content to the furnace from 65% to 80% would provide an additional 1.1 million Btus/ton of heat for steam generation and use only 0.4 million Btus/ton for evaporation. International Paper Co. has investigated the feasibility of applying thin-film evaporation techniques in order to concentrate black liquor to higher solids levels. Pilot plant studies confirmed the technical feasibility of attaining up to 90% solids with thin film technology; but the investment is only marginally attractive now.

Significant savings in evaporation have already been achieved by several mills working with the evaporator feed liquor. The basic principle employed in these efforts has been to minimize dilution. The actions taken include: the use of mechanical seals on pumps to eliminate dilution by gland sealing water, the exclusion of clean waters (such as eye-wash fountains and cooling waters) from black liquor recovery sumps, preevaporation of black liquor with digester blow steam, and more efficient pulp washing equipment or additional washing stages to reduce the water dilution factor.

Replacement of standard rising film evaporation with a falling film system has been another effective approach to reducing energy usage. The gains available from a falling film evaporator system result from its ability to transfer heat with only a few degrees of temperature difference between the condensing vapor and black liquor at its boiling point. As can be seen in Figure 7, a falling film evaporator has high heat-transfer coefficients at almost zero temperature difference. This unique feature makes it possible to design an 8- to 10-effect evaporator system or to reduce the pressure of the steam supplied to the first effect of a 6-effect evaporator from 50 to 15 psi. An 8-effect, falling film evaporator with 200°F feed liquor will produce a 65% to 68% solids product liquor at a steam economy of 7.8 lb of evaporated water/lb of steam used. A standard rising film 6-effect evaporation system followed by a 2-effect concentrator provides a steam economy of 4.8 lb of evaporated water/lb of steam used with the same feed liquor.

Recausticizing

The lime kiln has been an obvious target as a potential source for energy savings, and efforts in this area have not gone unrewarded. The most noticeable difference in new kiln installations is the addition of satellite product coolers at the discharge end. But care should be taken in their application, since coolers may not provide the maximum energy savings available when the complete liquor-making system is considered. Slakers should be used at the maximum temperature to optimize reaction rate and produce white liquor that will require a minimum of steam to reach cooking temperature in the digesters. The objective in this area should be an overall reduction in energy usage by the recausticizing system.

Effective energy-saving modifications and additions include:

• Reduction of radiation losses from the kiln shell through improved internal insulation and aluminum paint on the shell exterior

• A heat-recovery hood over the kiln hot end to serve as an air intake plenum for the kiln's secondary air fan

• Use of dirty condensate for washwater

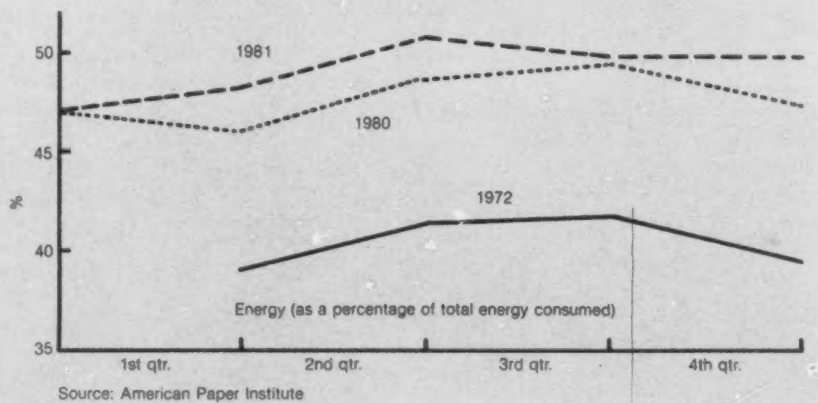
• Improved insulation on tanks and piping

• Use of an electrostatic precipitator for particulate removal, or heating makeup and washwater in a kiln's scrubber

• Reduced leakage from hoods, ductwork, conveyors

• Improved control of the total operation involving recausticizing.

Figure 6. **Pulp and paper industry self-generated energy as a percentage of total energy consumed: 1972, 1980, 1981**



Source: American Paper Institute

Woodyard

The most significant change that has taken place in the woodyard in response to rising energy costs has been in chip and bark conveyor design. Pneumatic conveying systems, with their high-energy requirements, are now generally restricted to special applications, and the more energy-efficient belt conveyors have returned to favor.

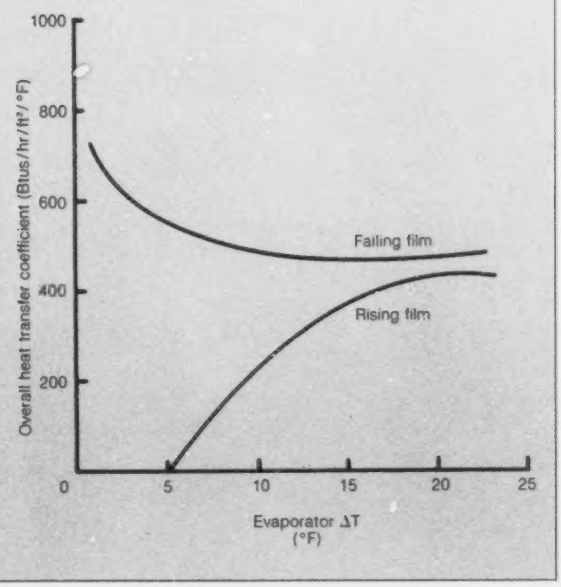
Improved chip screening has also provided dividends. The use of high-capacity multiple-stage disc screens has permitted removal of knots and other coarse rejects from the chip feed to the digesters. The result has been an increase in pulp yield as well as quality, and reductions in cooking steam and energy use in screening and refining.

Digesting

The increased need to reduce energy usage and to minimize fluctuations in steam demand from batch digesters has encouraged the most significant progress in digestion technology since the continuous digester arrived on the scene in the 1950s. Some of the improvements, such as steam accumulators and indirect heating of cooking liquor, are not new ideas, but today's economic environment has made them much more attractive. The steam accumulator—or thermal energy storage (TES) system—dates back to developments made between 1910 and 1920 and has been extensively applied since then in Scandinavia, where high energy costs have prevailed for a long time.

The on/off operation of batch digesters imposes a varying demand on steam supply. Even when multiple units are carefully scheduled, variations in steam demand can be rapid and of significant magnitude. A TES system has the potential to meet these short-term energy variations, which may typically last only 15 to 30 min. Energy is stored, not exhausted into the atmosphere during periods of surplus supply, and is removed from storage during periods of shortage. The TES system is estimated to provide an average energy savings equivalent to about 0.03 barrels of oil/ton of pulp production.

Figure 7. **Comparison of heat transfer for falling and rising film evaporators**



Other improvements in the batch digester system—with significant energy savings—include the use of blow steam to preheat cooking liquor, computer control of the cooking cycle, separation of hot- and warm-water accumulator tanks in the blow heat recovery system, and dual-pressure steaming of digesters. Dual-pressure steaming involves using a lower-pressure steam (for example, 50 psi) for initial heating of the digester contents with the normal 150- to 165-psi steam supply used for increasing the temperature to the desired cooking level and maintaining it for the duration of the cook. The use of lower-pressure steam for process heating increases the heat drop available through in-plant steam turbines for electric power generation. An additional 8 kwh/1000 lb of steam can be generated by reducing the turbine back pressure from 65 psi to 25 psi.

A major attraction of the continuous digester has been its lower total energy requirement for operation. This advantage, although reduced by advances in batch digester technology, is still substantial as a result of improvements. Some of these improvements include the use of a countercurrent flow of white liquor (to the flow of chips) and the use of digester blow and flash steam in the multiple-effect evaporators.

Washing and screening

Brownstock washing has traditionally been accomplished after batch digesters with a 3- to 4-stage drum system, and following continuous digesters with a diffusion washer system of one or more stages (frequently followed by a drum thickener).

Adding more washing stages further reduces the dilution factor and results in higher solids black liquor to the evaporators. A reduction in soda losses to the process sewer is also obtained. The most intriguing recent development in washing is the new fourdrinier-type washer developed by Georgia-Pacific Corp. This application provides the pulp mill engineer with the opportunity to design for six, eight, or ten wash stages with a corresponding reduction in the dilution factor and an increase in black liquor solids. Solids concentration of 22% or higher to the evaporators are easily achievable.

Effective energy-saving measures with existing washing equipment have included better use of hot water through separation and storage and the replacement of steam doctors on washer drums with air or mechanical doctors. The utilization of dirty condensate for shower water has also proven to be an effective energy-saving measure.

The emphasis on energy reduction is also reflected in both the application and placement of the pulp-screening operation. In general, the result has been a gradual movement of screens from a position after the washers to a position ahead of washing to provide the washing system with a relatively constant flow of debris-free stock. Placement of screening ahead of washing has also permitted several linerboard mills to obtain top liner stock by removing the soft, low-yield fiber produced in a single cook. A 2% increase in total fiber yield compared with dual cooking has been claimed.

Bleaching

Reduced water usage in the bleaching process has been a major contributor to reduced energy usage. This has been primarily done by applying countercurrent methods and generally closing up the operation. The average reduction in water usage from 20,000 gal/ton to 5000 gal/ton or less has provided other major advantages. This downward trend is expected to continue.

Process and equipment changes contributing to reduced energy requirements include the use of an oxygen stage and elimination of one or more conventional bleach stages. Kamyr Inc.'s unique displacement bleach system, and increased use of medium-consistency technology for all bleach stages. Energy savings have also been found in the design of washer/air-doctor systems through the use of recirculated air and in better heat-recovery systems. Reclaim of low-grade heat in cooling water, which would be subsequently sewered or removed in a cooling tower, is now recognized by all as nonproductive.

TMP pulping

During the 1970s, thermomechanical pulp (TMP) developed into the leading process for mechanical pulping, despite the increasing cost of energy. The improved strength of TMP compared with groundwood, and the ability of TMP in higher-quality grades to replace chemical pulp, have more than offset the higher energy costs incurred. The sharp upward increase in energy costs since 1979, however, has brought additional attention to the energy problem with generally satisfying results.

Energy is applied to the TMP process mainly as power to operate the refiner. A significant, but smaller, amount of energy is required in the form of steam for high-temperature, high-pressure treatment of chips prior to the primary refining stage. This preheat stage offers the first opportunity to conserve energy. Since more than 90% of the refiner motor energy input is converted to heat in the refiner, and nearly all of it is available as steam, heat-recovery systems have been developed to capture this heat and use it to generate high-pressure steam at an efficiency comparable to a commercial boiler.

Process controls

No area has been more rewarding in reducing pulp mill energy usage than the application of computer controls. Process heat consumption depends on the equipment used, process conditions, and operating rates. Minimum heat consumption will be required when all process variables can be optimized for the prevailing operating conditions. Establishing and maintaining optimum conditions in a dynamic situation requires collection and evaluation of a lot of data. The programmable controller has made this seemingly impossible task routine. The end result is a process more responsive to changing conditions and lower energy costs. □

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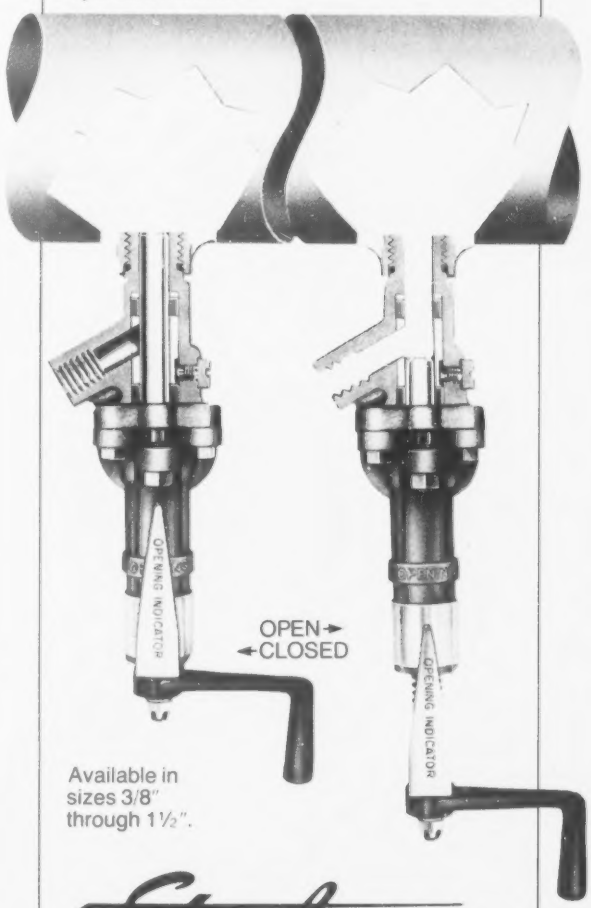

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Twin-wire formers: special survey details the technology now in use

PULP & PAPER's special report on twin-wire formers discusses recent design advances and summarizes installations in North America

By HAROLD M. CODY, Technical Editor

☐ Use of the twin-wire forming concept has advanced rapidly since its commercial beginnings in the late 1950s. Today, it is basically the standard method used on new machines for production of newsprint and tissue grades. There are currently an estimated 79 twin-wire units (excluding multi-ply board machines and special tissue/ towel machines) in operation in U.S. and Canada.

To assess the current status of commercial twin-wire forming technology, PULP & PAPER obtained information from former manufacturers on the various units available worldwide. In addition, a detailed analysis of installations was done to provide an overview of the status of commercial installations and planned expansions.

Since the first twin-wire designs began to appear in the late 1950s, a variety of machines have been introduced, and most major paper machine manufacturers now offer a twin-wire former product line. Available units can be conveniently grouped into generic categories that generally describe the basic forming/ drainage methods used. While special cases may warrant additional consideration, five basic groups are used in this article to classify the available commercial options. These are:

- Converging wedge (sometimes referred to as blade formers in reference to the drainage mechanism)
- Roll former with suction
- Roll former without suction
- Hybrid
- Multilayer with top fabrics.

The formers are categorized by tradename in Table 1.

When classifying the various wet ends using the above definitions, it becomes apparent that even the term twin-wire is not completely definitive. In most of the original machines, the stock jet from the slice was immediately deposited between two wires, or onto one wire with the second immediately sandwiching the sheet. Thus, the sheet was actually "formed" between the wires. But the simplicity of this definition gave way as new commercial options became available. This increasing complexity is exemplified by the most recent advance in this area, the hybrid unit.

In the hybrid area, various designs are available for rebuilding existing fourdriniers and for installations where an existing base fourdrinier is not used. In the case of a rebuild, the unit is positioned above an existing fourdrinier table some distance down the fourdrinier wire from the primary headbox. The sheet is initially dewatered on the fourdrinier table (some modifications to the original table may be necessary), and the top wire then contacts the felt side of the sheet for upward dewatering. Therefore, the sheet is not actually formed between the wires, and the term twin-wire former is somewhat inaccurate in this case. However, since these units incorporate similar concepts and since their

Table 1 **Twin-wire wet end options available by manufacturer and type of configuration**

Manufacturer	Converging wedge or blade former	Suction roll former	Roll former without suction	Hybrid former[1]
Beloit Corp.	Bel-Base II		Twin-Wire tissue	Bel-Bond
Black Clawson	Verti-Forma I,J,V			
Dominion Engineering		Paperformer		Dynaformer
Escher Wyss			Tisco Former	Twinformer, Twinco
J.M.V.		Pentormer MW	Pentormer LWF	Pentormer H
Valmet		Speed Former		Sym-Former F,N,R[2]
Voith		Duoformer C	Duoformer T	Duoformer HF

1. The sheet is initially formed on a conventional fourdrinier style table (in the case of a rebuild), followed by a second wire which contacts the top side of the sheet.
2. The Duoformer H is a top-wire unit designed for a base fourdrinier.
3. Sym-Former R is designed to be placed on an existing fourdrinier.
4. Escher Wyss Twinformer is designed for rebuilding existing fourdrinier.

Note: This listing does not include the category "Multilayer with top fabrics(s)," although there are twin-wire designs used for this application.

development is tied to the original units, they are considered twin-wire formers in this article.

There is also a wide variety of machine configurations where an additional wire, or wires, and additional headboxes are used in the manufacture of multi-ply board. These machines layer the various plies together, often using different furnish mixes. Machines of this nature will be discussed in general and some of the more interesting configurations noted, but all the various units available will not be detailed here.

(For a comprehensive report on all multi-ply forming units available, including detailed operating and technical considerations, see PULP & PAPER, Dec. 1978, pp. 89-104; or contact PULP & PAPER, Reprints, 500 Howard St., San Francisco, Calif. 94105.)

Table 2 **Distribution of paper machines in the U.S., Mexico, and Canada having twin-wire formers, by manufacturer and type**
(operating as of August 1, 1982)

Manufacturer	Former type	U.S.	Canada	Mexico	Total
Beloit	Bel Baie		2		2
	Bel Baie II	14	6	2	22
	Bel Bond	5	1	1	7
	Twin-Wire Tissue	8	1	2	11
Black Clawson	Verti-Forma I,II	3	6	2	11
	Verti-Forma V		1		1
Dominion Engineering	Papriformer	2	8		10
	Dynaformer		(3)		0
Escher Wyss	Tisco Former			1	1
	Twinformer				0
KMW	Performer LW	7	2		9
	Performer MW	6			6
	Performer R		1		1
	Performer H				
Valmet	Sym-Former F	3	(4)		3
	Sym-Former N	1	2		3
	Sym-Former R				0
	Speed Former				0
Voith	Duoformer C	1			1
	Duoformer F	(6)		1	1
	Duoformer H				0
	Duoformer T	1			1
Total		51	30	9	90

(1) There are five paper machines in the U.S. currently operating with Bel Bond formers. Three machines have a single unit, one has 2 units, and one has five units on boxboard.
(2) A second Bel Baie II is scheduled for a late 1982 startup at Ontario Paper, and two additional units may start up in late 1982 or early 1983 at New Brunswick International Paper.
(3) The first North American installation of the Dynaformer should start up in late 1982 at Inland Empire Paper Co., Spokane, Wash.
(4) Canfor, Liard Forest Products will bring the first Sym-former F in Canada in line late 1982.
(5) Abitibi-Price is scheduled to bring the third Sym-former N on line later this year.
(6) Duoformer F for the U.S. will be installed at Union Camp's Eastover, S.C. mill.
Note: This list does not include twin-wire units designed primarily for multi-ply paperboard applications.

Machine distribution

As shown in Table 2, various machines have attained differing degrees of commercial acceptance in terms of the number of units now operating in North America. Table 3 illustrates that, although some specific concentration of the different types by grade produced does exist, there is considerable crossover. In the following discussion under each generic category, the various manufacturers' machines will be briefly described. In many cases, the prototype installations will be mentioned, and the distribution of operating units in North America will be reviewed. The design specifics of each unit, comments on applications, operating performance and speeds, and a schematic of each former follow the general discussion.

Generally, the advantages of twin-wire wet ends compared with the fourdrinier are: improved sheet quality, reduced two-sidedness, and better printing characteristics. Some general characteristics are inherent to each generic type, but operating specifics do vary depending on many factors. Typically, roll formers exhibit better retention than converging web units or fourdriniers, while converging web formers often exhibit better formation due to the same pressure disturbance characteristics that cause lower retention. The hybrid unit is actually an attempt to combine the benefits of the fourdrinier (that is, preforming the sheet on the single wire) and the reduced two-sidedness of the twin-wire. However, for producing grades such as coated paper, the fourdrinier will probably continue to be very competitive.

Converging web formers

The first commercial twin-wire formers to gain wide acceptance were the converging web-type formers. These units, which include Beloit's Bel Baie II and Black Clawson's Verti-Forma, are operating at more installations in North America than any other single former type.

Beloit's Bel Baie II concept was developed folowing that company's introduction of the Inverform, Twinverform, and the original Bel Baie former. Following the success of the Inverform in the late 1950s at St. Anne's Board Mill Co. Ltd. in the U.K., the next step in the Beloit program was the Twinverform.

The first commercial unit of this design was installed at Kimberly-Clark Corp.'s Niagara, Wis., mill in 1965. The mill is now operated by Niagara of Wisconsin Paper Corp., and the machine (No. 4) produces 145-in.-trim groundwood basestock for the production of coated No. 5. This unit also has the distinction of being the first commercial twin-wire former that was used for paper grades.

On the original Kimberly-Clark machine, the top wire unit had a forming box consisting of a solid, rounded nose piece, which the wire wrapped to contact the sheet. The sheet was supported at this point by the breast roll and bottom wire. Following the forming box on the top wire were 11 blades, 1.5 in. apart, each with a 0.5-in. face. About 18 to 20 in. of water vacuum was applied to the box for upward drainage.

The bottom wire run had a foil positioned 6 in. after the trailing edge of the top forming box. Six slotted flatboxes followed under the bottom wire, with the last flatbox positioned after the top wire turning roll. The two wires ran together for 14 ft before the top wire separated. Initial machine speeds were 1750 fpm to 1850 fpm. The machine produced a sheet with better formation, less two-sidedness (brightness, color, and ash), less wire

Table 3. **Number of formers producing various grades, by type of twin-wire**
(U.S. and Canada only)

Grade	Type of former: Converging wedge	Suction roll former	Roll former without suction	Hybrid
Newsprint, directory, groundwood specialties	23	10	1	6
Tissue/towel	0	5	20	0
Printing/writing	4	0	0	5
Kraft/corrugating medium	2	1	0	1
Boxboard	0	0	0	1

marking, and improved sheet quality when compared with its predecessors.

The next step in the evolution of the Beloit twin-wire line was the original Bel Baie former. The first commercially successful unit was installed as a rebuild of the No. 3 paper machine at Quebec North Shore (Q.N.S.) Paper Co. Ltd. in Baie Comeau, Que.

The No. 3 newsprint machine had a 264-in. wire, and trimmed 240 in. The Bel Baie former was positioned over a suction box on the existing 260-in. fourdrinier, which had been installed in 1964. The fourdrinier was shut down on June 23, 1969, and the first paper was made on the new machine on July 1. Startup speed was more than 2700 fpm, and for the three months following the startup month averaged better than 2800 fpm.

In this prototype installation, the slice jet enters the nip formed by the top wire (supported by an open wire-covered roll) and the bottom wire (supported by a breast roll and followed by a solid forming shoe). After the forming shoe, the wires wrap an open roll, where drainage occurs through the bottom wire and also through the top wire, due to centrifugal force as the wires wrap the roll. The wires then pass under a third open roll to a horizontal plane. Centrifugal force caused by the wrap of the third roll forces water through the bottom wire. Drainage on the horizontal wire section is aided by flatboxes, after which the top wire separates from the sheet.

In 1971, a second Bel Baie went into operation at the same mill. The new No. 4 machine was a much larger version of No. 3, and is still one of the world's largest twin-wire formers with a 386-in.-wire and a 360-in. trim. In all, five Bel Baie units similar to the Q.N.S. former were built.

The next-generation Bel Baie (designated by a II) introduced the vertical forming concept. The first commercial Bel Baie II was No. 9 paper machine at Jujo Paper Mfg. Co. Ltd. in Japan. The Jujo machine began producing directory grades with an ash content of 6% to 8% on Oct. 9, 1972. The machine has a 222.5-in. trim and a design speed of 2650 fpm.

About two years later, the first Bel Baie II to produce paper in the U.S. started up. In January 1974, the rebuilt No. 5 machine at International Paper Co.'s Mobile, Ala., complex began making 30 lb/3300 ft^2 newsprint. No. 5 has a hydraulic headbox, a wire width of 284 in., and was designed for speeds to 2800 fpm. The wires pass over a 200-in.-radius segmented forming shoe, followed by a low-vacuum suction box and a large-diameter, compartmentalized suction roll.

In 1976, Ontario Minnesota Paper Co. (now Boise Cascade) started up the first Bel Baie II in Canada at its Fort Frances, Ont., complex. The largest Bel Baie II operating in the world, and the largest twin-wire machine anywhere, is the 400-in.-wide unit operating at the Obbola AB linerboard mill in Sweden. This huge machine, which was started up in August 1975, has a maximum trim of 372-in. and can operate at speeds to 2000 fpm. It was probably the first twin-wire machine in the world specifically designed to produce linerboard, and the original machine had a Strata-Flo layered headbox, which was also reportedly the first installation of this technology.

More Bel Baie II units are operating worldwide, (and also in North America) than any other single former type. Reportedly, the fastest Bel Baie II is the 380-in.-wide North Pacific Paper Co. (Norpac) unit—one of two—in Longview, Wash., that has operated at speeds approaching 3900 fpm on newsprint. The Norpac machine is also equipped with an air dryer that is reportedly designed to stabilize the sheet, reduce wrinkling, and impart strength to the sheet prior to the conventional dryer section.

Bel Baie II formers in North America have widths ranging from 167 in. to 386 in. Only two units have widths less than 200 in., while nine are in the 200- to 300-in. range, and ten units have widths in excess of 300 in. The majority of the Bel Baie formers produce newsprint, and a few are used for production of fine papers and corrugating medium.

The Black Clawson version of the converging web former is designated the Verti-Forma. The first commercial unit started up at Canadian International Paper Co.'s Three Rivers, Que., mill on March 19, 1968, as a rebuild. The machine (No. 6) was originally built in 1923. The interesting technical feature of the original Verti-Forma design was that the sheet was formed vertically downward. In the I version, each wire has a couch roll. The sheet is formed and drained down between the two wires. Then one wire breaks off and returns back around to the breast roll. The carrying wire wraps its couch roll and transfers the sheet to the press section from the bottom, or underneath, side of the forming fabric.

In the next version of the Verti-Forma, the J configuration, the sheet is initially formed in a manner similar to the I configuration, but the two wires and sheet then wrap a single couch roll. This sandwich continues horizontally until the top wire wraps a turning roll and separates, with the bottom wire transferring the sheet to a pickup. Three units of this type are currently operating in the U.S., and six of these units are running in Canada. Widths range from 166 in. to 314 in.

The most recent Black Clawson version is the Verti-Forma V, which is radically different from the I and J units. The first commercial installation of the Verti-

Forma V started up in April 1982 at Consolidated Bathurst's mill in Trois Rivieres, Que. This 210-in.-trim unit is designed to produce groundwood specialties and directory grades. The sheet is formed vertically upward into a nip formed by the two wires, and drainage is accomplished by a number of deflectors. The sheet is then carried between the wires until it is transferred to a pickup felt.

Roll formers without suction

Another concept in twin-wire forming is dewatering the sheet between two wires as the sandwich wraps a roll or rolls. Roll formers that do not employ vacuum to augment drainage are used to produce tissue, towel, and absorbent grades. These machines tend to be very high-speed units, unless they are equipped with through-dryers. Operating speeds are in the 6000-fpm range, and design speeds approach 7000 fpm. The KMW Periformer LW of this type at the PWA Waldhof Co. mill in West Germany is reportedly one of the fastest machines in the world (see PULP & PAPER, Sept. 1981, p. 226), and runs at speeds in excess of 5800 fpm. The design speed of the original installation was 6560 fpm.

Examples of roll formers that do not have vacuum-augmented forming or couch rolls are the Beloit Twin-Wire Tissue, the KMW Periformer LW, and the Voith Duoformer T machines.

The Crescent former developed by Kimberly-Clark is not a true twin-wire former, since it forms the sheet between a wire and a felt. Its drainage mechanism is similar to that of a roll former with a solid forming roll, however, because it drains water through the wire, due to centrifugal force and wire tension developed as the wire wraps the roll. The Crescent Former is also a high-speed unit, and installations in the late 1960s were running at speeds exceeding 5000 fpm. The two original units, installed at Kimberly-Clark's Beech Island, S.C., mill, were operating in the 4500 to 4600 fpm range and had a design speed of 5000 fpm.

Seven KMW Periformer LW units are currently operating in the U.S., and two are running in Canada. The units operating on tissue and towel in the U.S. have wire widths ranging from 123 in. up to 216 in. Top design speed of the North American units is reportedly 6250 fpm. The Periformer LW uses an S-shaped, or zig-zag, dewatering configuration, which differs from the Beloit Twin-Wire Tissue or Periformer MW technology.

Eight Beloit Twin-Wire Tissue machines are now operating in the U.S. When both Canada and the U.S. are considered, the Beloit unit and the Periformer LW are tied for the most installations with an estimated nine operating machines each. On the Beloit machine, the sheet is formed around a forming roll, and the wires then separate without wrapping an additional roll.

One Voith twin-wire former, the Duoformer T, is operating in the U.S. with a solid forming roll. It started up in 1978 at Marcal Paper Mills Inc. in Elmwood Park, N.J. This 222-in.-wide, 5900-fpm (design speed) unit produces tissue. This machine has reportedly operated in excess of 6000 fpm this year.

The Escher Wyss Manchester version of the roll former without suction is the Tisco Former. The first unit of this type started up in December 1981 in Apizaco, Mexico, and is designed to produce tissue, towel, and napkin. This 116-in. unit has a design speed of 5250 fpm.

Suction roll formers

Suction roll formers, as the name implies, use a vacuum-augmented suction or couch roll arrangement to aid in sheet drainage. Examples of this type include the Dominion Engineering Papriformer, KMW Periformer MW, Voith Duoformer C, and the Valmet Speed Former.

In 1972, the world's first commercial Papriformer started up at the Kruger Inc. mill in Bromptonville, Que. This unit had a 174-in. wire, trimmed 161-in., and was designed for speeds to 2900 fpm on newsprint.

Southland Paper Mills Inc. (now part of St. Regis Paper Co.) brought the first U.S. commercial Papriformer installation on-line in 1974 to produce newsprint at its Houston, Texas, mill. This unit was much larger than the original Kruger installation, and had a 326-in. wire. There are eight Papriformers currently operating in Canada and two in the U.S., with wire widths ranging from 174-in. to 326-in. All of these units produce newsprint grades, although several installations in Europe make fine paper and tissue.

The original Papriformer, as supplied to Southland, has an "S" wire-run configuration. The sheet is formed between the two wires in a nip formed by a solid breast roll and the forming roll. The forming roll on the Southland machine is a 48-in.-dia drilled roll with one suction box with a vacuum of about 4 in. of water (for 2700 fpm). The sandwich wraps this roll, and water is drained in both directions. The principle is then reversed as the sheet passes around the couch roll where vacuum is applied to the other side of the sheet.

On the Southland unit, typical operating conditions for the couch roll are 2 psi of pressure in the first compartment, followed by a stabilizing box at atmospheric pressure and two vacuum zones with 15 in. and 21 in. of water, respectively (at 2700 fpm).

The Voith Duoformer C also uses a zig-zag configuration, and is equipped with a suction forming roll and a suction couch roll. The No. 3 paper machine at Publishers Forest Products Co., Newberg, Ore., is the only Duoformer C operating in North America. This machine consistently produces newsprint at about 3400 fpm.

The Valmet Speed-Former is designed primarily for newsprint production, and has a solid forming roll and a suction couch roll. This unit has a somewhat unique wire run, since both rolls are inside the same wire loop. Currently, there are no Speed-Former installations in North America, but five units are operating worldwide.

The KMW Periformer MW uses a vacuum forming roll. The sheet wraps this roll and the top wire then separates. Six Periformer MW units are operating in the U.S., producing grades ranging from corrugating medium to towel. The largest of these is the 281-in.-wide unit at Owens-Illinois Inc. in Tomahawk, Wis. This machine is rated at 700 tpd on corrugating medium, and has a maximum operating speed of 3000 fpm. Several Periformer MW units in the U.S. are dedicated to towel production, and Fort Howard Paper Co. has a number of these units.

Hybrid formers

The most recent—and one of the most interesting—concepts in twin-wire forming is the hybrid unit. For the purpose of this discussion, the term hybrid is used to designate a paper machine where the sheet is initially laid

on a fourdrinier table, after which a top wire is applied in some manner. Additional headboxes are not used in hybrid formers, and the top wire is used only for dewatering. Within the hybrid category, several units are available with machines designed both as rebuilds of existing fourdrinier paper machines and as complete new installations or complete new wet ends.

Examples of units designed for rebuilding an existing fourdrinier include Beloit's Bel Bond, Dominion Engineering's Dynaformer, Valmet's Syn-Former R, KMW's Periformer H, and Voith's Duoformer H.

When the various options available under the hybrid former category are considered, a further subdivision of unit types is necessary. With an existing fourdrinier modification, the top wire unit can dewater using a blade or shoe configuration, or the sheet and wires can wrap a roll or rolls.

The Bel Bond is an example of a unit where the fourdrinier wire initially dewaters the sheet and then the top wire contacts the felt side of the sheet. The top wire wraps a solid forming roll, followed by an inverted blade/suction box configuration. The first Bel Bond on paper grades started up in 1980 at MacMillan Bloedel Ltd. in Powell River, B.C. The 228-in.-wide No. 7 paper machine produces newsprint at speeds to 2500 fpm. Five paper machines are currently running with Bel Bonds in the U.S., one in Canada, and one in Mexico.

The Dominion Engineering Dynaformer and Voith Duoformer F are examples of upward drainage technology where roll forming is utilized. On the Dynaformer, after the sheet is formed on the fourdrinier table, the top wire wraps partially around a grooved roll (80% open area) and contacts the sheet as it wraps the bottom of the roll. The sandwich of the two wires and the sheet then passes upward and over the top of a second forming roll, which is a solid rubber-covered roll. Drainage occurs in both directions at the first forming roll, and upward only at the second solid forming roll. The two wires then pass under a transfer roll, and the top wire is separated at a 2° to 4° angle while the sheet follows the bottom wire. The first Dynaformer unit is not driven, but is powered by the fourdrinier wire. The first Dynaformer unit in North America should start up in late 1982 at Inland Empire Paper Co., Spokane, Wash.

Voith offers two hybrid former versions, one designed for rebuilding a fourdrinier (Duoformer H) and one designed as a totally new machine (Duoformer F). The Duoformer H is positioned on top of the fourdrinier, and is similar in concept to the Dynaformer. It also uses a solid forming roll. Most of the water is removed upward at the forming roll. The two wires separate over a solid wire roll, and the web follows the bottom wire to the suction couch roll passing over several flatboxes.

The Voith Duoformer F also has a short fourdrinier-type table followed by a top wire which sandwiches the sheet prior to the vacuum forming roll. The two wires separate from the forming roll, pass over a deflector on the top wire side, then wrap a suction couch roll on the bottom wire side. The two units are not interchangeable. The F configuration has a wider basis weight and speed range and greater flexibility and dewatering capacity. The first Duoformer F to be installed in the U.S. will start up at Union Camp Corp.'s new Eastover, S.C. mill and will produce uncoated fine papers.

Valmet has three hybrid former designs, the Sym-Former F, N, and R. The R unit is a recent offering designed for rebuilds of existing fourdriniers. It also utilizes a roll configuration to drain the sheet upwards. At the present time, there are no Sym-Former R machines operating in North America. The F and N configurations are similar in concept, and differ mainly in the grades produced. The F design utilizes a flat initial fourdrinier table, whereas the Sym-Former N has a table that slopes upward toward the second wire. The N design is primarily used for groundwood grades such as newsprint, and the F version is designed for fine papers, filled papers, and kraft papers. There are now three Sym-Former F units and one Sym-Former N unit operating in the U.S. Two Sym-Former N newsprint machines are operating in Canada. The Sym-Former N, due to its uphill dewatering zone and longer forming shoe section, has higher potential operating speeds.

The first commercial Valmet twin-wire machine started up on Sept. 6, 1973, at United Paper Mills in Simpele, Finland. The Sym-Former unit had a 116-in.-wide wire, a 109-in. dewatering shoe, and was originally designed for speeds to 2500 fpm on groundwood printing grades (18 lb/3000 ft^2 to 37 lb/3000 ft^2). The basic arrangement was similar to the Sym-Former F concept with a flat fourdrinier table initially forming the sheet.

The Escher Wyss Manchester versions of the hybrid are the Twin-Former and the Twinco Former. The Twin-Former is designed to increase the capacity of an existing fourdrinier, and drains the sheet upward by the roll concept. The Twinco is designed for lightweight printing papers, and is a hybrid unit with a top wire that drains the water as the wires pass over a large radius shoe and then around a smaller-diameter forming roll.

Multilayer with top fabric(s)

The majority of multilayer units are used in the manufacture of heavier-weight papers and paperboard grades, including kraft linerboard, bleached paperboard, and boxboard. A variety of units are used in this area worldwide, including the Bel Bond, Inverform, Voith Duoformer K, Tampella Arcu-Forma, and Kobayashi Ultra Twin-Former.

A recent entry into the field of twin-wire papermaking is the Tampella Contro Flo Former. The first commercial installation of this unit began operating in 1980 at the Enso-Gutzeit Oy mill in Pankakoski, Finland. The Contro Flo Former does not have a free discharge jet; instead, the headbox is sealed against the former. This unit is capable of operating at lower speeds than other twin-wire formers, and can produce high-basis-weight sheets.

As previously mentioned, the variety of formers designed for this application will not be discussed in detail here, although some of them do use twin-wire technology. An example of a very unusual machine is the No. 7 paper machine at Manville Forest Products Corp., West Monroe, La. This unit has a base Tampella fourdrinier, two Arcu-Forma twin-wires, and a minifourdrinier. The base fourdrinier has a 256-in. wire, and measures 92 ft from breast roll to couch roll. The two Arcu-Forma units are used to form filler plies, and are then "married" to the sheet on the base fourdrinier. A small top fourdrinier is used to form the top liner.

An example of the Bel Bond unit used for multi-ply boxboard production is the No. 3 paper machine at St. Regis in Battle Creek, Mich. This machine has five Bel Bond formers with a headbox at each station. □

CONSTRUCTION

Trend to merit shop construction increases in pulp, paper industry

Low-bid construction, performed by merit shop contractors, has in many cases reduced paper industry expansion costs, shortened building time

By SCOTT ROBERTSON

☐ Ten years ago, few people had ever heard of merit shop construction. At that time, a pulp and paper company with a major expansion to build probably could not have found more than one or two merit shop contractors large enough to handle the job. Since then, the volume of jobs performed by merit shop contractors has grown dramatically. In 1981, merit shop contractors performed 63% of all construction in the U.S.

The term merit shop construction still depends on the person(s) defining it. But in fact, merit shop construction projects are contracts let to the lowest bidder, whether or not that bidder is a signator to a union agreement. Included in the merit shop definition are union contractors who have agreements with building trades unions that allow them to subcontract work to nonunion subcontractors. The definition also includes the merit shop general contractors who subcontract work to union contractors. Or, in some cases, a contract may be an all nonunion project. Excluded from the definition are projects which, because of agreements with the building trades unions, are only let to unionized contractors.

High wages, cheap money

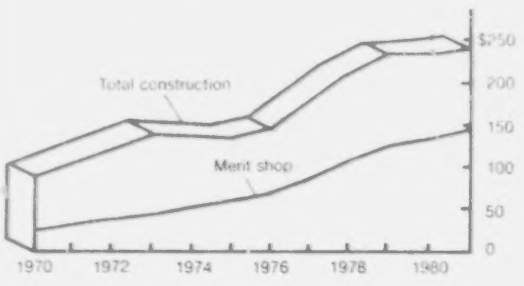
What brought about this change in building trends? High union wage settlements passed along to owners who once had no difficulty in obtaining cheap expansion money was the beginning. The "go-go" era of cheap money is gone now, but it set the stage for the rising use of merit shop construction in the pulp and paper industry.

In the late 1960s, all negotiated union wage rates began to rise faster than the country's productivity, with the building trades unions' wage rates leading all the rest by far. In some cases, construction unions were negotiating wage increases in excess of 30% annually. It should be kept in mind that this was occurring in 1960, not 1980. Union contractors who had enjoyed a monopoly on major industrial construction were passing these wage increases on to their clients. However, in 1968, construction users began a subtle rebellion which in little more than ten years has led to a major shift from union construction to merit shop construction.

In 1968, the U.S. Chamber of Commerce organized a conference of major construction users and contractors to discuss the problems of escalating wage rates and other labor problems that significantly added to the cost of building. Recommendations from that meeting centered around contractors dealing with construction unions on a united front basis. But in an industry of more than 200,000 contractors, such cooperation seemed unlikely.

However, the idea was good. But it languished until Roger Blough, former chairman of United States Steel, formed the Construction Users Roundtable, the forerunner of what is today called the Business Roundtable. The Roundtable began to gather top corporate leaders to discuss the consequences of construction users allowing the

Figure 1. **The merit shops' growing share of the contruction dollar**



Volume of merit shop construction compared with total construction volume, billions of dollars.

Source: Associated Builders & Contractors Inc.

Mr. Robertson is communications manager, BE&K Inc., Birmingham, Ala., and formerly was with Associated Builders & Contractors

current trends to continue. As a result of the Roundtable's efforts, many of the nation's largest corporations began qualifying merit shop contractors to bid on major projects.

Sixty percent merit shop

According to the Associated Builders & Contractors (ABC)—the trade association for merit shop contractors—the merit shop segment of the construction industry did only about $18 million of work in 1968, or less than 20% of the total $87 billion construction market at that time. By 1981 the nation's total construction tab had reached $250 billion and the merit shop segment had grown to the point where it was doing almost 60%, or more than $150 billion of work.

The annual survey by the National Constructors Association (NCA), a group of the largest unionized industrial contractors, is indicative of the growth of the merit shop. In 1977, the NCA survey indicated only $28 billion of merit shop construction. By 1981 that figure had grown to more than $77 billion annually. Most of the major pulp and paper companies had representative projects on the merit shop list.

Some questions, which need to be answered to understand not only why there has been such a tremendous growth in merit shop construction, but also why the growth has not been even quicker, are discussed below. The advantages that merit shop construction offers the pulp and paper industry center around productivity, a potential 10% to 15% construction cost savings, management control, the elimination of a third party (union), and the ability to respond quickly to correct any project problems.

Savings not in wage rates

It is a surprise to many project managers that the cost savings on merit shop projects does not necessarily come in whole or, in some cases, even in part from wage rate savings. In most instances, there is parity in wages between merit shop workers and unionized workers. In fact, in some areas, merit shop wage rates actually exceed basic union wage rates. If there is disparity between merit shop and union wage rates, it is the result of the competitive labor market in the area of the project.

John R. Heizelman, writing as a senior estimator for Arco Oil & Gas, Dallas, Texas, recently outlined some of the savings to be found on merit shop projects. While his remarks centered around chemical and refinery construction, parallels can be fairly well drawn between that industry and the pulp and paper industry.

Some of the points Mr. Heizelman made include:

"... If the job is in or near a large city that has been union controlled for any length of time, the productivity of all workers is lower than in a city of equal size not strongly unionized. As the control of a union decreases, the overall productivity of all workers improves."

"... Union contractors pay show-up time of 2 hours/day/worker as long as the worker reports to the gate ready for work. If work is started and inclement weather stops it, the worker gets 4 hours of pay. If any work is performed after lunch hour, workers automatically receive 8 hours of pay (merit shop contractors normally pay only for the hours worked). Standard practice is to figure 5% of total wages for lost time on a union project."

"... The union will determine the ratio of apprentices on the job. This rigid manpower loading is nonproductive and lends itself to an inefficient operation."

"...Under union work rules, the selection of craft foremen and general foremen is entirely the responsibility of the employer. But in actuality, the union selects the craft foreman, general foreman, and area foremen for unionized contractors."

The big nonboom

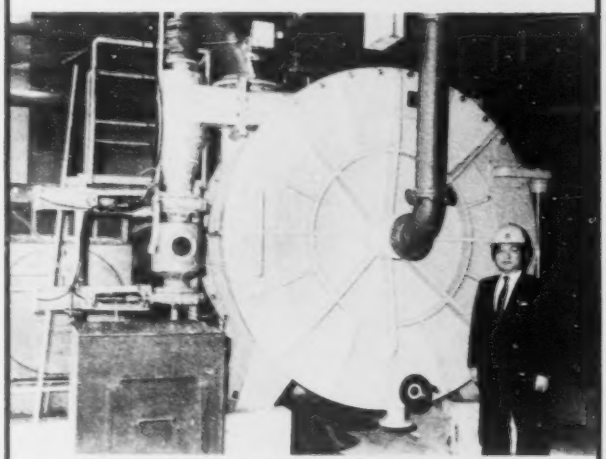
Mr. Heizelman's comments actually only scratch the surface of the differences between union and merit shop construction. Costs of jurisdiction disputes, shutdowns, slowdowns, and strikes, coupled with several hundred pages of work rules ("area practices"), can add significantly to the cost of union construction.

The next question that should be asked is: if union construction is so costly, why have all contracts not gone merit shop? In some areas they have. The unions seem to have never really made a serious attempt at modernizing work practices. Instead, they appear to have been waiting

Pulp and paper industry projects recently constructed by merit shop contractors

Hammermill Paper Co.	Selma, Ala.	International Paper Co.	Springhill, La.
International Paper Co.	Selma, Ala.	International Paper Co.	Mansfield, La.
Georgia-Pacific Corp.	Crosett, Ark.	Boise Cascade Corp.	Rumford, Maine
Southwest Forest Industries	Snowflake, Ariz.	Madison Paper Industries	Madison, Maine
Container Corp. of America	Fernandina Beach, Fla.	Weyerhaeuser Co.	Crawford County, Mich.
Georgia-Pacific Corp.	Palatka, Fla.	Kimberly-Clark Corp.	Cornith, Miss.
St. Regis Paper Co.	Pensacola, Fla.	Weyerhaeuser Co.	Columbus, Miss.
St. Regis Paper Co.	Cantoment, Fla.	Federal Paper Board Co.	Lilesville, N.C.
Continental Forest Industries	Port Wentworth, Ga.	Federal Paper Board Co.	Riegelwood, N.C.
Kimberly-Clark Corp.	Augusta, Ga.	Weyerhaeuser Co.	Valliant, Okla.
Macon Kraft Co.	Macon, Ga.	Union Camp Corp.	Eastover, S.C.
Proctor & Gamble	Oglethorpe, Ga.	Bato Co.	Richmond, Va.
Boise Southern Co.	DeRidder, La.	Bear Island Paper Co.	Hanover City, Va.
Georgia-Pacific Corp.	Plaquamine, La.	Continental Forest Industries	Hopewell, Va.

Slush Separator of High Quality from Japan



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for a building boom for almost ten years to regain bargaining leverage.

However, the boom has not come. In fact, there has been a very important nonboom. For the first time small merit shop contractors have been allowed to grow over a long period of time and establish relationships that, in better economic times, might have been cut short by what was once the union's ability to corner manpower. However, over the last ten years the merit shop, working through its trade association, the ABC, has developed several construction user services as well as manpower training programs which may have permanently replaced the need for building trades unions, even if building booms in the future. For the first time, the merit shop has developed skill training programs currently in use on many pulp and paper construction sites. These training programs have totally revolutionized the administration of training and manpower in the construction industry.

Wheels of learning

ABC calls its training program "Wheels of Learning." The program allows contractors to train local hires to do specific tasks, which cuts costs on merit shop projects. The program also allows merit shop construction craftsmen to improve their skills and learn new technology. ABC has also established a Construction Buyer's Service Center with a computerized merit shop contractor referral service to help construction users locate contractors and suppliers throughout the country.

Most important, merit shop contractors have caused a sense of competition in the construction industry. This competition has actually reversed the trend of annual construction wage increases doubling those of manufacturing wages. Except on the West Coast, unionized contractors can no longer pass on exorbitant wage increases to construction users. However, many observers believe the West Coast and Pacific Northwest are now ripe for the same shift to merit shop construction that has taken place in the rest of the U.S. over the past decade.

The union's initial response to increased merit shop competition in the 1960s was what *Fortune Magazine* called a "full arsenal of traditional weapons—boycotts, picketing, violence, and all the political legislative pressure they could muster." But, in the pulp and paper industry, the building trades unions have generally found little sympathy from in-plant unions. Few workers have been willing to give up their jobs for temporary building tradesmen earning more than twice their wage rates.

The main reason for the success of merit shops is the tremendous amount of time and money saved by merit shop construction, and because most merit shop contractors have an experienced public relations, legal, and management staff familiar with labor related problems.

Unless abrupt changes occur in the advantages merit shop contractors offer clients in the pulp and paper industry, it is unlikely the current trend will stall. Merit shop contractors are already building in areas that were once thought to be "union-only" strongholds. Innovations in construction methods, human relations, training, and productivity are coming from the merit shop segment of the construction industry. And interestingly enough, the only changes that have occurred in the building trades have come about because of the competitive pressures placed upon the unions by the successful entrance of the merit shop into the free enterprise system. □

Pulp mill market share growing, prices steady

By BARRY SHOCKETT

The overall market for hydrogen peroxide (H_2O_2) has been stagnant, but pulp mill usage has been growing steadily since 1979 at an average annual rate of 8% to 8.5%. Pulp mill usage could increase 20% to 25% in 1982. Total peroxide consumption should resume an 8%/year increase when economic conditions improve.

Consumption of Canadian hydrogen peroxide is expected to increase at least 30% this year, due primarily to growth in mechanical pulp production.

U.S. statistics for hydrogen peroxide (000 short tons)

	1979	1980	1981	1982e
Nameplate capacity	143	197	193	193
Production	114	116.5	112	115.5
Apparent consumption	124	109	107	108
Pulp bleaching	11.5	12	13	13
Exports	9	13.5	12.5	14.5
Imports	19	6	7.5	7

Sources: Bureau of Census, U.S. Dept. of Commerce, PULP & PAPER estimates

Canadian statistics for hydrogen peroxide (000 short tons)

	1979	1980	1981	1982e
Total demand	6.3	7.5	8.3	10
Pulp bleaching	4	5.2	5.7	7.5
Miscellaneous*	2.3	2.3	2.6	2.5
Imports	6.6	9.4	8.8	10
Exports	0.3	1.9	0.5	—

*Including textile bleaching and water treatment

HYDROGEN PEROXIDE

UNITED STATES

Uses: The pulp and paper industry uses H_2O_2 to bleach chemical, mechanical pulps and to deink recycled newspaper stock. Its major use is as a chemical intermediate. This is followed by the treatment of waste and water, textiles, and mining.

Demand: In 1982, an estimated 16,000 tons of H_2O_2 will be used in pulp bleaching, compared with 13,000 tons in 1981. Total consumption in 1982 is likely to reach 108,000 tons, up slightly from the 107,000 tons consumed last year. Bleaching applications have increased their share to 15% of the total. Chemical synthesis applications use almost 30% of the total product, but this market has been depressed recently due to weak chemical markets. Imports make up less than 7% of demand. This will decrease slightly in 1982.

Sources: U.S. producers include the following (in decreasing order to capacity): E.I. Dupont, FMC, Interox America, and PPG.

Availability: There exists sufficient surplus capacity to satisfy domestic U.S. demand, with last year's industry operating rate being less than 60%, compared with the 80% rate that was prevailing in 1979. 1981, market; 1980, market; 1979, market; 1978, market.

Pricing: Despite an attempted hike in price this summer, the 39.5¢/lb tag for 70% solution, f.o.b. producing point freight equalized, is still in effect. Pricing history: 1981, 39.5¢/lb; 1980, 35.5¢-36.5¢/lb; 1979, 32.5¢/lb.

Forecast: The increased use on chemical pulps, added with a move by many newsprint mills towards higher-brightness groundwood sheets, should maintain an annual growth by the pulp and paper industry of close to 10% for the next few years. No price increase is expected until late in the fourth quarter this year or early in the first quarter of 1983, and will probably be in the neighborhood of 10%.

CANADA

Uses: Mechanical and chemical pulp bleaching consumes most of the H_2O_2 that is produced. Other uses for this chemical include textiles and treatment of water.

Demand: The pulp and paper industry will use an estimated 7500 tons (75% of total) of H_2O_2 in 1982, a 30% increase from the 5700 tons used in in 1981. Total demand should rise to 10,000 tons from 8300 tons in 1981.

Sources: Imports supply the total Canadian demand for hydrogen peroxide, about 80% of the market accounted for by U.S. product. The major importers of this chemical are C-I-L (from FMC) and DuPont Canada (from its U.S. parent). Both FMC and E.I. Dupont sell on a direct basis as well, as does Interox America.

Availability: The Canadian demand can be easily supplied by the excess U.S. capacity. 1982, market; 1981, market; 1980, market to tight; 1979, market; 1978, market.

Pricing: As in the case in the U.S., there has been no price change since January 1981. Bulk 70% solution, f.o.b. works, is still listing at $1.16/kg (52.2¢/lb). Pricing history is: 1981, $1.16/kg (52.2¢/lb); 1980, 95.8¢-$1.05/kg (43.5¢-47.5¢/lb); 1979, 90.6¢-95.8¢/kg (41¢-43.5¢/lb).

Forecast: The strong growth in thermomechanical (TMP) pulping capacity as well as the switch by many newsprint mills to groundwood specialties should result in an annual increase. This annual increase should average almost 17% to 1985. This amount is twice the average rate realized over the last three years of the previous decade.

The consumption of H_2O_2 next year will be futher increased when West Fraser begins to use peroxide bleaching at Quesnel River Pulp. Half of the TMP output of the mill is being converted to chemimechanical (CTMP) pulp. West Fraser will be switching over to peroxide in July 1983.

Mr. Shockett is consulting editor-chemical markets for PULP & PAPER.

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Issue focus: **Pulp processing, Finishing**

New twin-wire, high-speed paper machine at Consolidated-Bathurst 128

PULP&PAPER

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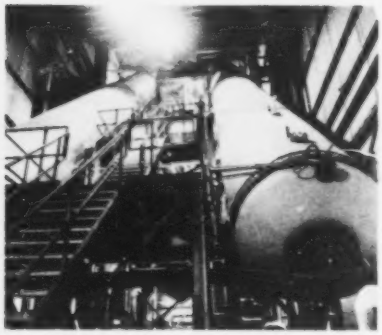

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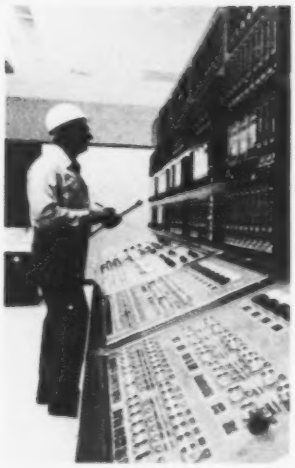

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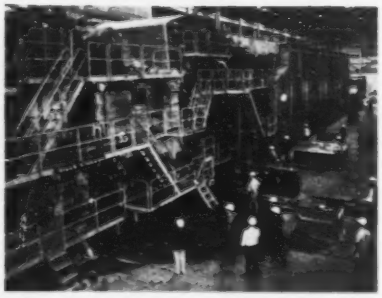

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COVER: *Time-lapse night photograph of Union Camp Corp.'s Franklin, Va., mill, where new $37-million oxygen bleaching system is now on-line (see story on page 90). Photo courtesy of Airco Industrial Gases, Murray Hill, N.J.*

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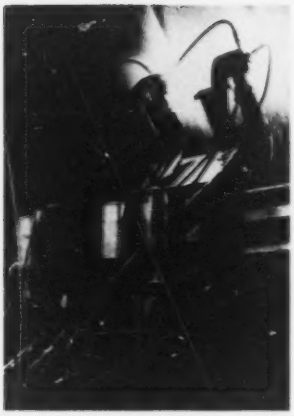

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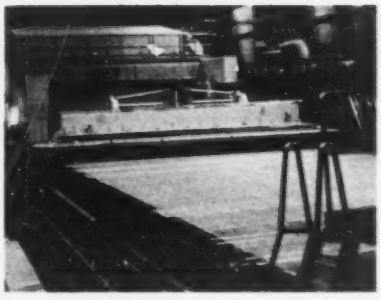

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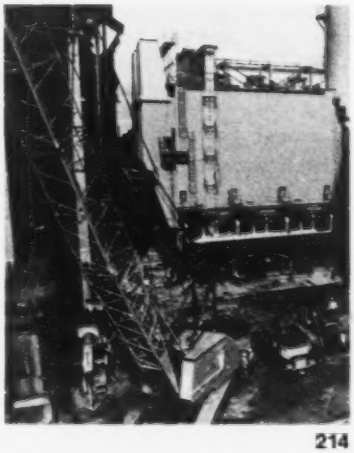

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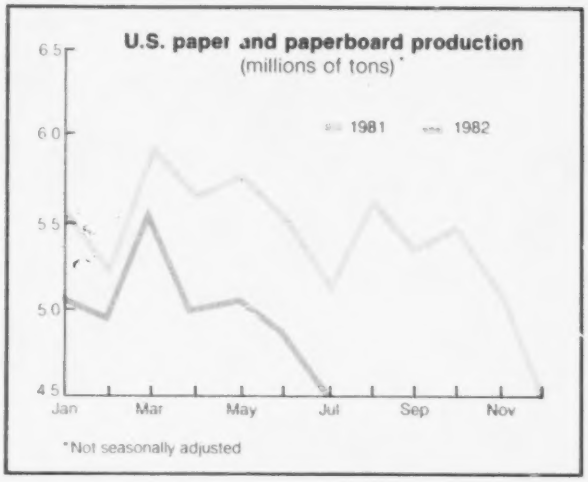
U.S. paper and paperboard production in July totaled 4.5 million short tons, down 8.7% below the July 1981 total, according to the American Paper Institute. Adjusted for seasonal and workday factors, the July-August production rate, based on data for the first two weeks of August, came close to 57.6 million tpy, down from the second-quarter average of 57.8 million tpy and the first-quarter average of 60.0 million tpy.

Among major grades, newsprint production fell in July, although just about matching its year-ago level for the first seven months, and printing/writing paper output declined largely as a result of weakness in uncoated free sheet. Tissue production has been flat since April, while some strength is evident in packaging/industrial grades. All major grades of paperboard continued to show declines in production in July, with the largest falloff in unbleached kraft linerboard, down 14% from year ago.

Total Canadian newsprint shipments in July came to 615,000 metric tons, down 16.6% from July 1981, according to the Canadian Pulp & Paper Assn. Newsprint mill operating rates slipped to 71% in July from 79% in June and were well below the 87% rate of a year earlier.



		Latest month (000 short tons)	% change from year ago	Annualized year-to-date (000 short tons)	% change from year ago
PAPER & PAPERBOARD PRODUCTION[1]					
Newsprint	July	400	−10.3	5,177	0.1
Uncoated groundwood (s)	July	114	1.8	1,401	−4.6
Coated paper (s)	July	392	1.6	4,920	0.4
Uncoated free sheet (s)	July	563	−9.3	7,708	−4.2
Unbleached kraft packaging and industrial (s)	July	285	−4.0	3,618	−8.8
Tissue	July	330	−4.9	4,347	−3.0
Total paper	**July**	**2,303**	**−5.6**	**30,138**	**−3.4**
Kraft linerboard, unbleached	July	1,004	−14.1	13,623	−9.0
Semichemical medium	July	344	−11.6	4,441	−9.3
Bleached paperboard	July	294	−9.0	3,763	−6.9
Recycled paperboard	July	481	−8.4	6,642	−7.7
Total paperboard	**July**	**2,208**	**−11.8**	**29,548**	**−8.4**
Total paper and paperboard*	**July**	**4,511**	**−8.7**	**59,686**	**−5.9**
PULP, WASTEPAPER & FIBER[2]					
Total woodpulp production	June	4,181	−5.3	51,033	−4.5
Market pulp production	June	491	−8.7	5,999	−4.2
Wastepaper consumption at paper/board mills	June	1,136	−8.3	13,877	−3.8
Pulpwood consumption (cords)	July	6,737	−0.8	79,502	−1.8
CONVERTED PRODUCTS STATISTICS[3]					
Corrugated box shipments (billion ft²)	July	18.610	−10.1	136.200†	−6.8
Containerboard inventories at box plants	July 1	2,649	11.9		
INTERNATIONAL TRADE[2]					
U.S. paper imports (including products)	June	705	3.4	8,099	−5.1
Imports of Canadian newsprint	June	570	0.4	6,792†	−4.3
U.S. paper exports (including products)	June	386	−1.3	4,300	−13.7
Exports of unbleached kraft linerboard	July	146	−18.9	1,917	−4.3
Exports of woodpulp	June	302	−15.9	3,575	−7.7
CANADIAN STATISTICS[4] (reported in metric tons)					
Total newsprint shipments	July	615	−16.6	4,761†	−8.2
Operating rates	July	71%	87%	86%	95%
Inventories held by U.S. consumers	July 31	1,511	3.4		
Woodpulp shipments (export only)	July	465	4.7	3,443†	−16.2
Operating rates	July	68%	72%	81%	89%

1. American Paper Institute. 2. API, Bureau of Census, American Pulpwood Assn. 3. Fiber Box Assn., Paperboard Packaging Council. 4. Canadian Pulp & Paper Assn.
*Includes construction and wet machine grades. †Not annualized. ‡Not directly comparable to year ago because of coding change. (s) = shipments.

Paper-grade chemical market pulp: Market still in downswing

Statistics:	1980	1981	1982e
UNITED STATES			
Production, 000 tons*	4457	4402	4190
Annual capacity, 000 tons	4653	4897	4943
Utilization rate, %	95.8	89.9	84.8
Apparent U.S. consumption, 000 tons	4547	4474	4000
Imports, 000 tons	2438	2390	2060
Exports, 000 tons	2348	2318	2250
CANADA			
Production, 000 tons	6605	6080	5000
Annual capacity, 000 tons	6690	6810	6810
Utilization rate, %	98.7	89.3	73.4

*Market pulp reported in metric tons (metric ton=2205 lb or 1.1023 short tons)

Grade structure: Paper-grade chemical market pulp is sold competitively in the market and does not include captive pulp used on-site or shipped to affiliated mills within North America. It includes bleached and unbleached sulfite, bleached, semibleached, and unbleached kraft and soda pulps. Pulp is sold in sheeted or flash-dried bales, as roll pulp, or as fluff pulp which is also sold in rolls. Paper-grade chemical pulp is sold for use in paper and paperboard and for some nonpaper products such as diapers and molded items.

Production/capacity: In 1981, North American chemical paper-grade market pulp production totaled 10.48 million metric tons, down 5.2% from 11.06 million tons the previous year, with most of the decline in Canada caused by a six-week strike in British Columbia. This year North American pulp production is expected to decline about 12%, to 9.2 million tons, due to weak worldwide demand and relatively high inventory levels.

U.S. production is expected to decline about 5%, to 4.2 million tons, while Canadian output is expected to drop about 18%, to 5 million tons. U.S. mills have tended to run at higher levels this year and marketed their output aggressively, while Canadian and Scandinavian producers have taken more downtime.

Shipments by U.S. mills were down 1% for the first seven months of 1982, while those from Canada dropped 19% and Sweden's declined 17%. Operating rates for all five North American and Scandinavian producing countries for the seven-month period averaged 80.5% compared with 88.5% in the same period of 1981.

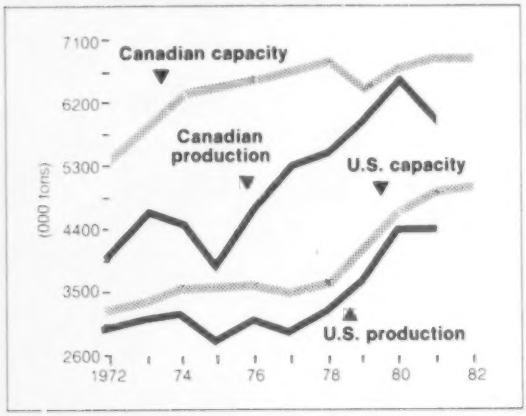
Nevertheless, Norscan producer stocks at the end of July stood at 1.87 million tons, up from 1.4 million at the end of December, when an approximately average level was reached.

Pricing: Sluggish demand and the strong U.S. dollar have caused a serious deterioration in pricing. Northern bleached softwood kraft (NBSK) pulp began to erode in the second quarter and by early August had reached the $465/metric ton c.i.f. level in northern Europe. This was down from the $545 price which has prevailed since the last successful price increase in second-quarter 1980. Deterioration in southern softwood and hardwood pulp prices came earlier and has been more severe, with a $100/ton or more gap developing between NBSK and these shorter-fiber pulps in both Europe and the U.S.

In the domestic market in early August, NBSK was still reported to be selling mainly at $490/metric ton ($445 short) list, southern softwood kraft at $370 to $390/short ton, and southern hardwood at $330 to $350, with spot sales considerably below these levels and more deterioration in contract levels likely.

Year-end prices for these grades in $/short ton U.S. market were (*indicate discounting from list levels): northern bleached softwood kraft—1975, $372; 1976, $372*; 1977, $310*; 1978, $340; 1979, $417; 1980, $481; 1981, $513; southern bleached softwood kraft—1975, $340; 1976, $320*; 1977, $280*; 1978, $321; 1979, $400; 1980, $475; 1981, $475; southern bleached hardwood kraft—1975, $320; 1975, $280*; 1977, $240*; 1978 $290; 1979, $385; 1980, $458; 1981, $458*.

Outlook: While pulp prices will probably bottom out late this year, any market improvement will lag overall recovery of the paper industry and probably not come until well into 1983.



Estimated capacities of major companies are:

	Annual capacity (000 metric tons)	Capacity share (%)
1. Weyerhaeuser[1,2,3,5]	1000	8.5
2. Georgia-Pacific[1,2,5]	700	6.0
3. BC Timber[1,3]	580	4.9
4. Parsons & Whittemore[1,2]	570	4.8
5. Great Lakes Forest[1,2,3]	570	4.8
6. Canadian Forest Products[1,3,4]	505	4.3
7. B.C. Forest Products[1,3,4]	490	4.2
8. Procter & Gamble[1,5]	480	4.1
9. MacMillan Bloedel[1,3,4]	430	3.7
10. Noranda[1,2]	363	3.1
11. Federal Paper Board[1,2]	355	3.0
12. Boise Cascade[1,4]	355	3.0
13. International Paper[1,2]	315	2.7
14. ITT Rayonier[1,5]	305	2.6
15. Scott Paper[1,2,5]	300	2.6

Key to grades: 1—bleached softwood kraft; 2—bleached hardwood kraft; 3—semibleached softwood kraft; 4—unbleached softwood kraft; 5—bleached sulfite

*Capacity shares based on equity ownership, excluding less than 50%-owned affiliates

North American capacity (1982): **11,753 million tons**
Capacity share of top five companies: 29.1%
Capacity share of top ten companies: 48.4%

U.S. bleached board supply/demand

Full operating rates likely by 1984; export milk carton, ovenable board shipments look promising; so does the domestic asceptic market

By DAVID R. ALLAN, News Editor

☐ Despite the reasonably healthy performance of the solid bleached sulfate (SBS) market in the deep recession of 1982, widespread doubts persist about the future vitality of this sector of the industry—resulting largely from the decade-long slump in domestic paperboard milk carton demand. But as International Paper Co. consumer packaging vice president Glen Dell told PULP & PAPER in the following interview about the overall status of the solid bleached board market, important end-uses for SBS—including domestic milk board—give reason for optimism about the mid-1980s.

DELL

Dell: I think there are two false impressions that over the last couple of years, certain of our customers as well as other suppliers and the market in general have had. The first one is that the bleached board market is going to be so tight that it will be very short of capacity. Some of our customers have been afraid that prices would run up dramatically, making bleached board uncompetitive.

P&P: *You think this is a false impression?*

Dell: I think it is, because, even though some capacity's come out of the industry, some is going in. There are machine speedups taking place, and IP in particular is increasing capacity. That will add to the bleached board system, and keep supply and demand in good balance.

The other false impression is the one that people get when they just look at U.S. data, not recognizing that bleached board markets are really worldwide. And they've tended to look at only U.S. supply/demand and say there is significant overcapacity. That's not true, either, because of the rapidly growing export markets. But while one group has been talking about overcapacity, another group has been talking about tight markets. I don't think either view is accurate.

The first chart (Figure 1) shows IP's view of worldwide demand and supply a year ago. Let me emphasize it's the total bleached board market. In about 1982, demand slightly exceeds capacity. These are API capacity figures and they don't recognize, for example, IP's reconfiguration of the Georgetown mill, which is going to add about 100,000 tons to the bleached board market. Unfortunately, some people looked at the chart and didn't hear the words.

I've updated that chart (Figure 2). Some changes have happened since a year ago. One is, the economy didn't recover this year, so there's been a flattening, in fact even some slackening of demand. In terms of those long-term growth trends, there's obviously been in 1981 and 1982 much lower demand. That put the five-year growth trend lower. The demand line, in our judgement, has come down. API lowered capacity figures between last year and this year, but our own capacity has been built into that. You'll see that it just about reaches full capacity in 1984, but doesn't cross over. Demand does not move forward and exceed capacity. We have a relatively balanced situation. That's the overview as I see it.

P&P: *What is your estimate of total bleached board productive capacity? How much of that would you call "swing capacity" between board and market pulp? How much, if any, constitutes swing capacity between bleached board and bristols?*

Dell: I think the easiest way to express it is that by our calculations, U.S. capacity in bleached board machines is 5.5 million tpy. That's sourced from API. Of that, as we look at 1982, it's our estimate that 61% is generally dedicated to bleached board, 14% to bristols, 3% to pulp, and 22% swing capacity—any and all swing capacity.

Our system is such that we can move straight through the whole line, from bristols to folding to milk to cup to diaper pulp and almost any combination. Obviously, two of our machines have clay-coaters and three do not. You can't make folding carton stock on the three without coaters, but we do make milk carton stock, for example, on the two with coaters; therefore, there's a tremendous flexibility in our system. In fact, a lot of that U.S. swing capacity is in our system.

P&P: *What capacity trends do you see in the next five to seven years?*

balance depends on export markets

Dell: What I'd like to do is now focus in on the bleached board piece of that rather than dealing with bristols or pulp, which are not my responsibility. With bleached board, our estimate of the capacity increase between 1982 and 1987, to take a five-year period, is about 123,000 tons, most of which is IP's.

It could be more. If demand were higher, more of our capacity would be allocated to bleached board, so that capacity is somewhat dependent on demand. If that demand line were to increase, more of our capacity could be allocated to bleached board.

One difficulty is that a competitive bleached board machine—a new one—in my judgement, would have to be able to produce at least 250,000 to 300,000 tpy. There's not enough market growth, I don't believe, to encourage someone to put in a whole new machine. The capacity growth has to come from someone with the system capability that we have. Demand, as I see it, will not justify a greenfield mill or even a new machine over the next five years.

P&P: *One theory argues that current bleached board prices are too low to justify a completely new machine, and that if prices were to rise fast enough to justify new machines, then that might endanger the competitiveness of bleached board as opposed to other materials. Do you agree with that theory?*

Dell: Yes, I agree, but I would turn that around. I don't think that demand is sufficient to justify a totally new world-scale machine, and that in turn tends to dictate both price and return.

P&P: *Does that also mean you don't expect to see any dramatic price increases over the next five years that would justify that kind of expansion?*

Dell: I do not expect to see the kind of price increases that would justify new machines.

P&P: *Would you expect mills which are in a swing position, vis a vis market pulp, bleached board, and bristols to run better in terms of operating rates in the next five years than those that strictly produce milk carton stock or folding carton or whatever?*

Dell: No. A great deal of the capacity is not swing capacity and is geared more to specific markets and generally, therefore, can be more competitive in those markets.

P&P: *What operating rate do you expect for the bleached board industry this year?*

Dell: About 95%.

P&P: *In the fall of 1981 I think it was running in the 92% to 94% range; is it running close to 95% now? And what do you think will be the average for the next five years?*

Figure 1. **1981 projections: worldwide demand and supply for bleached packaging paperboard,1975-1985**

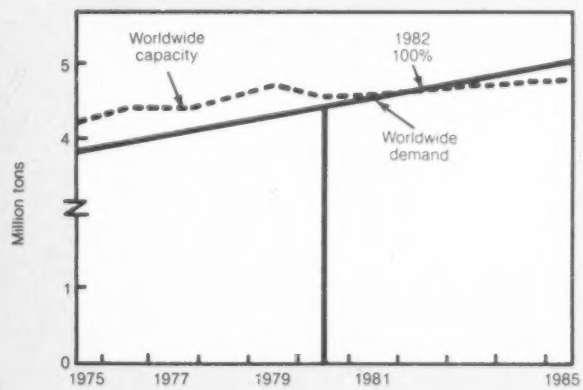
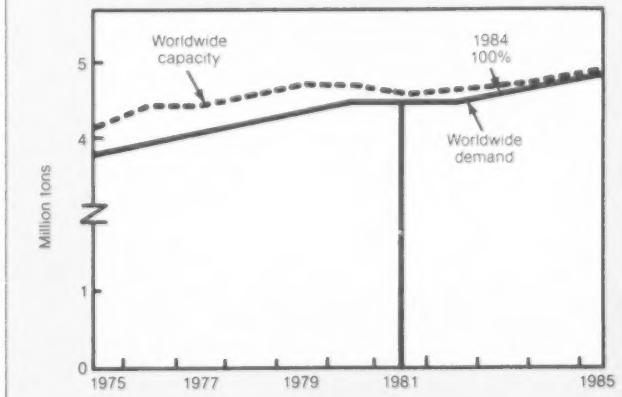


Figure 2. **Current projections: worldwide demand and supply for bleached packaging paperboard, 1975-1985**



Dell: It's about 95% right now. And I expect to see that 95% moving up to about 100% in 1984 and remain about 100%. It would change, obviously, if we had a recessionary dip out there. Our numbers are what we consider to be practical available capacity. Our numbers would indicate in the mid-90s. At any point in time, very late in the year, we all tend to build inventory and move towards downtime to perform maintenance or modernization work on the mills. Before Christmas, we built inventory and then took the machines down to work in the mills. So looking at any one time, it's a factor not only of the market but also the mill schedule.

P&P: *One observer told us that while total production of bleached board last year was up only 0.6% according to Census Bureau data, most of the growth was caused by inventory building during the year. Would you agree?*

Dell: I think that the bleached board statistics last year included some statistics of pulp. I don't think there was really an increase in bleached board shipments last year. Some companies, when demand weakened, ran roll pulp on their bleached board machines and it was classified as bleached board.

P&P: *What area of bleached board would you think would show the effect of a recovery in the economy first—folding cartons, milk...?*

Dell: Folding.

P&P: *Would that be because more people are eating out?*

Dell: No, it would be because one of the end-use markets I expect to improve over the next few years is frozen foods. Most market analysis has indicated that, over time, convenience foods—frozen foods—will be in greater demand. The economy has been in difficulty in the last few years, so higher-priced food hasn't increased. In fact, there's been a decline in frozen foods. Frozen foods are almost entirely bleached board; therefore, as frozen foods pick up, bleached board can be expected to increase. The general trend is tied very closely to the nondurables index. The higher-value foods tend to be packaged in paperboard. As people move to food purchases that are higher-valued, they tend to move more into cartons.

P&P: *Has the retort pouch had any effect on bleached board?*

Dell: None. Its time hasn't come yet.

P&P: *Will its time come in the next five years or so?*

Dell: Not enough to really affect these markets. You could argue that the retort pouch may substitute for frozen foods, but retort pouches are sold in cartons.

P&P: *Is the recession tipping the balance one way or the other in the battle for market share between recycled board and SBS? In the long term, where is the shift favoring SBS and where, in terms of end-uses, is the market-share shift favoring recycled board?*

Dell: Yes, I think it has been affected by the recession. I think you'll see that market share in folding cartons of recycled is up and bleached board down in 1982. There are two reasons: one is the end-use markets. Sales of cereal and dry foods, which use recycled board, tend to increase in a recession, and frozen foods, which use SBS, don't. Secondly, there have been switches to recycled board because of the lower prices. The basic furnish of recycled board is wastepaper, and waste prices have decreased dramatically. Waste prices are down at levels equivalent to 1968 and 1969, which makes the furnish, and therefore the board, less expensive. For some end-uses, packagers have chosen the less-expensive board.

P&P: *Is that going to swing back in the next year?*

Dell: Somewhat. I think there is enough growth in some of the SBS end-use markets to keep it relatively stable. I would expect a little faster growth probably in recycled board against SBS for folding cartons, but I expect growth in both.

P&P: *Would that slightly faster growth in recycled be due to continued pressure on the packager to cut his package costs?*

Dell: Yes. There's always going to be a trend to reduce costs. We've seen it as customers reduce the basis weight of board. They go down to lower-caliper board. When they can switch to a recycled board from an SBS sheet, that sometimes happens. But as we come out of this recession, waste prices will increase and the price differential between SBS and recycled will narrow.

The rapid increase in SBS prices from 1978 onward has been driven by energy costs. Many SBS suppliers are putting capital into reducing energy costs. At IP we're doing engineering work right now on coal conversions that should help keep escalating costs down, and so I believe the gap between recycled board and SBS will close for two reasons: One, we'll be able to do a better job of controlling energy costs; and secondly, waste prices will increase and result in higher furnish costs for recycled board.

P&P: *What is your estimate for total production of milk carton stock last year?*

Dell: Total U.S. SBS production, excluding bristols and pulp, was 3,840,000 tons. Milk, 1,033,000; folding, 1,707,000; bleached liner, 98,000; cup stock, 460,000; plate, dish, and tray, 291,000; and all other, 251,000.

P&P: *Would you expect that the more rapid growth rate of folding carton as opposed to milk carton stock over the last decade will continue? Will the trend of recent years toward lower per capita use of milk cartons in the U.S. continue? If so, when will use hit bottom, or will it disappear completely? Are there any marketing developments or economic trends that might stem the decline of domestic milk carton consumption?*

Dell: Domestic use of milk cartons has declined. You used a decade, but let me go back five years: It's declined about 5% a year. I forecast over the next five years a 4% decline rather than 5%. Basically, the slowdown is bottoming out. Fluid milk consumption has been flat, and the decline in bleached board cartons has been due to the use of plastic gallon containers. Plastic gallon containers have moved geographically across the U.S.. The last area to move to plastic was the Pacific Northwest, so now the decline should slow.

I expect the trend to plastics to bottom out—probably in the mid-80s. Over the next two or three years, however, the carton market will still be declining. But there may be a factor that will change this, because the industry is going to launch a print and radio advertising campaign followed by a television advertising campaign for the consumer. It will point out that there is a vitamin

loss—vitamin A and vitamin B2—in plastic containers.

Deterioration comes from effects of light; fluorescent or incandescent light. It's especially true in low-fat milk. About half of the market is now low-fat. In the processing of low-fat milk, natural vitamin A is lost and the dairies have added vitamin A. The vitamin A that is added is lost very quickly in containers such as plastic or glass which let fluorescent or incandescent light reach the milk. In 24 hours, 85% of it is lost. There's a significant loss in vitamin B2 also. We're telling consumers that milk is a super beverage. It's nutritional, and it's good for kids. But if they buy it in plastic, they're losing some of the nutritional value that it provides.

P&P: *Would you expect that the current flattening out of energy cost increases would improve the economics of the plastic container vs the paperboard carton?*

Dell: That's not really significant. We can provide two paper half-gallons, with a handle, for just about the same cost as a plastic gallon. The issue hasn't been the price of the package. The issue has been how supermarkets have priced a gallon of milk vs two half-gallons. In fact in this advertising campaign, we're promoting paperboard on the basis of what we call the 2-Pak gallon.

Our focus group studies indicate that consumers perceive value in buying a gallon—value in the sense that it's less expensive. Because we're providing a paperboard gallon package, the consumer now has the choice between the plastic gallon and the paperboard gallon. The cost of the packages is relatively the same, so the choice can now clearly be made according to which is more convenient, easier to handle, which stays fresh longer, which tastes better and which loses its nutrients.

P&P: *What would you expect to see happen to milk carton shipments this year and in five years? What is the outlook for export shipments?*

Dell: Let me take the entire milk carton market, and add the export shipments. Exports have been growing about 8% the last five years, and the growth in the export market is now larger than the decline in the U.S. market. So even with my forecast showing the U.S. market declining 4% a year, I think exports will grow at least 5% a year. So total growth will be at least 1% for paperboard milk cartons worldwide from U.S. capacity.

In fact, the deterioration in milk cartons per se has been worse than 5%, but it's been offset by rapidly growing juice consumption and, therefore, rapidly growing paperboard juice cartons.

P&P: *How large is the [juice board] base right now?*

Dell: It's about 70,000 tons and growing in the 8% to 10% a year range. It grew 8.5% in 1981.

P&P: *Which countries or regions of the world represent the strongest markets for U.S. [liquid packaging board] exports? Which will level off in this decade?*

Dell: Most significant is the Far East. Africa is also strong. Europe, we estimate, is going to grow in the 5% to 6% range; the Far East, a little faster growth. Countries like Korea are concerned about nutrition for their children and are promoting the use of milk and the growth of herds. Japan, for example, is using more and more milk, promoting the use of milk, as well as juice.

P&P: *Is the Japanese milk market as a whole still small?*

Dell: Well, it's small on a per capita basis compared to the U.S.; on the other hand, the total Japanese milk [carton stock] market is over 150,000 tons and growing.

P&P: *How much of that is produced domestically?*

Dell: It's mostly U.S. board.

P&P: *What kind of growth rate do you see in that?*

Dell: Probably 6% or 7%.

P&P: *Will the long-term trend toward asceptic packaging in Europe help the paperboard industry?*

Dell: Yes, but there is also growth in fresh milk sales in Europe. In the U.K., much of the market is still glass. There are some European milk carton suppliers using U.S. board who are about to try to make a switch in the U.K. market from glass to paperboard. The initial push will be for fresh milk rather than aseptic.

In Germany, Austria, and France, the growth over a 10-year period has been much faster in aseptic than in fresh milk. In Germany, for example, the market was about 50:50 aseptic and fresh. Over the last two years, the stronger growth has been in fresh. People are beginning to use milk more as a beverage rather than in cooking and in coffee.

The figures that I've been giving you are for bleached board to package fresh milk. Most aseptic board today is coming out of Europe, not the U.S. As the aseptic market grows, we will probably develop the capacity to serve it, but that's all outside of these figures.

P&P: *Aside from milk cartons, what products are among the fastest-growing consumers of export* SBS*?*

Dell: Liquid packaging is the fastest growing from a large base. Export folding carton stock has been growing a little more rapidly than domestic, largely because the U.S. has the fiber to support world folding markets.

In new product areas, ovenable containers are beginning to grow from a small base; some goes into export markets. One of the products that I'm very excited about is paperboard cans. We call it CanShield, an effective substitute for glass, metal, fiber cans, perhaps even for bag and box applications. IP provides an in-house forming machine so that a customer can use a preprinted blank in his own plant on his filling line to form a can. Initial uses are dry foods and snack foods, but it's moving into yogurt; it can move to greasy foods, pet foods, powdered drink mixes, ice cream, and as we further develop the concept, perhaps even into liquids. There's very high interest in the U.S. Overseas, Japan, for example, is already packaging potato chips in this type of container. The board will come from the U.S. It's a very small base—you can't expect over a five-year period to talk in terms of 100,000 tons—but it's growing.

Even if there are some end-use markets that switch from SBS to machine clay-coated news, there are enough new applications for bleached board for it to be on a growth trend in the 1% to 2% range. I think the charts I've showed you, which deal with the next five years, come out with total world demand growth of just under 2%. Frankly, we've been re-estimating that every year for the past three years and we've always come out around 2%. For the last five years, it's grown 2.1%.

P&P: *Is the plate, cup, dish, and tray market a pretty mature market or are there trends in place that could*

continue or foster increased growth in demand?
Dell: It's fairly mature except for the fast food industry. As many of the U.S. fast food companies move overseas, they take with them demand for cups, cartons and french fry scoops. Most of the board for that's going to have to come from the U.S.

P&P: *What kind of growth rate do you see in domestic folding carton?*
Dell: In the five-year period from 1981 to 1985, only just 0.3%. That's because of the low 1982 year.

P&P: *How big is the ovenable board market right now?*
Dell: It's about 10,000 tons and has been doubling every year. It's going to grow dramatically as the microwave oven penetration gets higher in the U.S. and as food processors begin to change to trays which can be used in microwave ovens.

There will be two major factors that will increase the growth. One is when we come out of the recession, the economy improves and people buy more frozen foods. And secondly, when microwave oven penetration reaches 45% or 50%, food processors are then going to want the dual oven capability *(Editor's note: IP estimates current microwave penetration at 25% to 30%.)*

P&P: *How big is the aseptic market today and how big would you expect it to be in five years, in the U.S.?*
Dell: It's just beginning. I think we're going to see rapid growth in juice applications. Companies that have already been in test market have been very pleased with it. There are differing opinions on how fast the aseptic milk market will grow in the U.S. Some very large dairy cooperatives believe that they can sell milk as a beverage in small sizes, and that aseptic milk will grow rapidly, especially flavored milk. They're putting quite a lot of money into that.

It's just very difficult at this point to estimate how fast it will grow. At IP we've developed aseptic systems for both milk and juice and we plan to provide the systems and provide the packaging materials. It would not be unreasonable in five years to expect to see demand at 40,000 or 50,000 tons, but that's a guess.

P&P: *What are the cost advantages for milk and juice in aseptic vs other technologies? Obviously it cuts down on refrigeration costs. But on a package-by-package basis, is there a cost advantage for aseptic?*
Dell: An aseptic package uses foil-laminated board, so it's more expensive than the current package for milk and juice; on the other hand, it's less expensive than metal or glass. But the shelf life, whether it's refrigerated or nonrefrigerated, is extended dramatically.

P&P: *Do you see a growing role for multi-ply boxboards containing a lower-cost inner layer(s) such as thermomechanical pulp (TMP) or secondary fiber in traditional SBS markets? Have the two such new machines started up in North America in recent years proven successful?*
Dell: There have been two machines, and I understand that there have been difficulties with both of them.

P&P: *Do they have economic advantages?*
Dell: I'm not sure. With energy costs going up dramatically, TMP has become more expensive than estimated five years ago. □

Aseptic cartons

By WILL MIES, News/Business Editor

Aseptic packaging appears to be off to a fast start in the U.S. and promises to open new markets for paperboard at the expense of glass bottles and metal cans, but how large this demand will become still remains unclear.

Such cartons—which can keep unrefrigerated juice, milk and other specialty food products fresh for up to six months—are common in Europe and many other parts of the world. But their introduction into the U.S. awaited last year's FDA approval of hydrogen peroxide as a sterilizing agent.

Test marketing flurry. Already a number of major food processors such as Ocean Spray, Borden, Coca-Cola Foods, and Del Monte have introduced fruit juices and drinks in aseptic cartons into test markets around the country. And some large milk suppliers are coming out with dairy products in such packaging this year. Dairyman Inc., for example, recently opened a $16-million aseptic processing plant in Savannah, Ga., with an initial capacity of 80,000 gal/day.

Leading this rapid market development has been Brik Pak Inc., a Dallas-based subsidiary of Sweden's Tetra Pak International, which submitted data for the FDA regulation. The company says it has commitments from the U.S. food and dairy industry for more than 60 aseptic packaging installations to go on-stream in 1982 alone.

In these machines, a strip of laminate is taken off a reel, sterilized with hydrogen peroxide, and formed into a tube. The liquid, which has been separately sterilized, fills the tube, which is then pinched off into individual packages with the product hermetically sealed inside. The resulting flexible brick-shaped packages range from 0.2 to 1 liter (6.8 oz to 1.1 quarts) in size. Since its first commercial installation in the early 1950s, Tetra Pak has dominated the aseptic packaging market, with 2200 installations worldwide last year which churned out 17 billion aseptic cartons.

Crowded machinery field. Other suppliers of brick-style carton filling machines are Blocpak Inc., a Toronto-based subsidiary of West Germany's PKL GmbH, and International Paper, which has acquired rights to European-designed equipment. Blocpak has leases for more than 10 of its Combibloc filling machines in North America, while IP has been conducting customer trials of its aseptic equipment in Walkill, N.Y., and has commitments from Real Fresh, a Visalia, Calif., dairy, and General Foods for commercial installations.

For those preferring the familiar gable-top carton, Ex-Cello-O Corp., Troy, Mich., has a machine that makes a foil-lined "extended shelf life" version of its widely licensed Pure-Pak carton; and Liqui-Pack International Inc. of St. Paul, Minn., has a machine for aseptically filling gable-top cartons.

IP is also demonstrating a "hot-fill" packaging system in Mobile, Ala., and has commitments for installations from Lincoln Foods, Lawrence, Mass., and Tree Fresh Foods Corp., Avon Park, Fla. Using the heated beverage for carton sterilization, hot-fill can extend unrefrigerated shelf life for several months and refrigerated life for up to six months. Larger size (64-oz) gable-top laminated cartons can be used, but only certain types of juices and drinks can be processed without